No. 2620 VOLUME 75 FRIDAY 10 APRIL 1959

FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

Official Organ of the Royal Aero Club First Aeronautical Weekly in the World Founded 1909

Editor-in-Chief
MAURICE A. SMITH D.F.C.

Editor
H. F. KING M.B.E.

Technical Editor
W. T. GUNSTON

Production Editor
ROY CASEY

IN THIS ISSUE

Prime Ministerial Visit 482
East German Engine Industry 486
Uninvited Electricity 487
Aeronautical Bookshelf 490
BOAC to Transocean 491
Valkyrie Wing 493
Storm-birds 494
Pacific Western 496

Iliffe & Sons Ltd., Dorset House, Stamford Street, London, S.E.1; telephone Waterloo 3333. Telegrams Flightpres Sedist London. Annual subscriptions: Home £4 15s, Overseas £5. Canada and U.S.A. $15.00. Second Class Mail privileges authorized at New York, N.Y.

Branch Offices Coventry: 8-10 Corporation Street; telephone Coventry 25210. Birmingham: King Edward House, New Street, 2; telephone Midland 7191. Manchester: 260 Deansgate, 3; telephone Blackfriars 4412 or Deansgate 3595. Glasgow: 26B Renfield Street, C.2; telephone Central 1265.
New York, N.Y.: Thomas Skinner & Co. (Publishers) Ltd., 111 Broadway, 6; telephone Digby 9-1197.

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A Matter of Survival

IF we have any complaint about the public utterances of Mr. Edward Bowyer, chief executive and director of the S.B.A.C., it is that they are not public enough. Because they are often of the greatest national significance. Especially so the latest, which propounds that research—aeronautical research—is the key to national survival. Not leadership or maintenance of standards. Survival.

We have, Mr. Bowyer points out, no choice other than to stay in the forefront of advanced engineering; which means in the forefront of aeronautical engineering. More than fifty millions live in the United Kingdom, and the greater part of their food, fuels and materials must be imported. The only way to pay for these things is to export products which others cannot make, or make so well. "I believe," Mr. Bowyer says, "that we do these things in the aeronautical field better than anyone else. But basically it means research . . ."

On a similar theme Lord Halsbury has stated the case in his own terms: "Increasingly, the aircraft industry first tackles, then solves and finally dominates the solution of problems which no other branch of engineering would have the incentive to attempt . . . Its results react on, and influence, general engineering industry so that by remaining in the forefront of aeronautical engineering we keep our position in the forefront of general engineering."

These are matters of tremendous gravity; and we share another of Mr. Bowyer's beliefs—that there will always be a British aircraft industry. He gives as his reason that both Government and Opposition are satisfied that the continuance of the industry is a good thing. And that is a notable opinion for the S.B.A.C. to endorse.

Firestreak's Little Windows

ONCE there was a rocket called Firestreak, which everyone knew as the very best rocket of its kind, and so clever because it had little windows that it could look through and see where it was supposed to go and what it was supposed to do when it got there. Now the wise men whose Minister caused this splendid rocket to be made, and who paid for it out of the money that the people of the Realm had given them, and who cared for it till it was ready to take its place as a Defender of the Realm, were terribly proud of it and wanted the whole world to know all about it so that other Realms could have some if they wanted to and had enough money. There was only one thing: they would never, ever, let anybody look through those little windows. So they had tiny blinds made for them. You see, if anybody looked inside they would learn the Secret of how Firestreak could see where it was supposed to go and what to do and when. And then it wouldn't be a Secret any more and the Realm couldn't be defended nearly so well.

One day, when the Firestreak was just becoming a Defender, the Queen's Head Minister took a day off from his High Office to go and see how all the Defenders were coming along. Of course, nobody minded *him* looking through the windows, because he knew lots of secrets anyway. But what do you think? Someone forgot to pull the blinds when the Gentlemen of the Press passed by, and of course they had a jolly good look and took pictures and wrote pieces for their papers.

Everybody was *frightfully* upset. I wonder what the Head Minister thinks about it all? Perhaps he will be giving somebody a great big rocket all of his own.

BEFORE 1960 IS OUT this Bréguet 941 STOL transport should be flying with four de Havilland Gnome turboprops. The Gnomes have recently been specified and are particularly suitable because of their light weight and free-turbine principle, which allows an inter-connecting installation for safety

FROM ALL QUARTERS

High Strategy

A DISPUTE as to how high the Berlin air corridors extend flared up between the Russians and Americans over Easter. It began on Good Friday, when the U.S.A.F. sent a Lockheed C-130 Hercules for the first time on a supply run to Tempelhof. It flew at over 20,000ft and was "buzzed" by Soviet intercepters both on its way to the airfield and on its way out. The U.S. authorities later protested to the Russians, saying that their fighters had endangered air safety; and at the same time the Russians protested against the flight of the Hercules, saying that no Allied aircraft could fly above 10,000ft when crossing East Germany.

The American representative at the four-power Berlin air safety centre had previously filed a flight plan for the C-130, giving its proposed altitude (20,000 to 25,000ft) and the Soviet controller had protested. The United States authorities, however, do not recognize any altitude limits in the three corridors to Berlin across East Germany.

There is apparently no agreed limit on altitude between the four Powers, but for several years aircraft of Britain, France and the U.S. have operated into and out of Berlin at altitudes between 2,500ft and 10,000ft. From the Russian point of view this arrangement is a convenient one, as it leaves the upper air space clear for their military aircraft; but from the U.S. angle, with the introduction of C-130s as supply aircraft in Europe, it is obviously desirable that they should be allowed to operate at higher altitudes.

To See America's Latest

AN ambitious programme has been planned for the first World Congress of Flight, which opens under U.S. auspices at Las Vegas, Nevada, next week. In addition to a Farnborough-type ground display of aircraft, missiles and equipment, and flying demonstrations at the exhibition site and at nearby McCarren Field, a large number of meetings and conferences will be staged in the new convention centre recently completed on the site. Firepower demonstrations by military aircraft will be held at the Nellis Air Force Base gunnery range at Indian Springs.

The programme will include a banquet to celebrate the tenth anniversary of NATO, which will be attended by Prince Bernhard of the Netherlands. British participation will include the attendance of three Avro Vulcans of No. 617 Squadron, R.A.F., commanded by A.V-M. G. A. Walker.

Flight coverage at Las Vegas will be by staff writer Kenneth Owen, who is visiting the congress as part of a comprehensive three-week tour of U.S. facilities at the invitation of the United States Air Force. Apart from Las Vegas, the main theme of the tour will be to study various aspects of Thor IRBM operations. Among the units to be visited—and reported in our issues of April 17, April 24 and May 1—are Strategic Air Command headquarters, Omaha; U.S.A.F. Ballistic Missile Division headquarters, Los Angeles; Vandenberg A.F.B., California; U.S.A.F. Missile Test Center, Cape Canaveral, Florida; Douglas Aircraft Co., Santa Monica; and AC Spark Plug Co. (Thor guidance system), Milwaukee.

M.o.S. Promotion

APPOINTED Director-General of Aircraft Research and Development (R.A.F.) at the Ministry of Supply, Mr. Lewis Boddington, C.B.E., M.I.Mech.E., F.R.Ae.S., has been M.o.S. Director of Aircraft Research and Development (R.N.) since 1953 and before that was an assistant director. Mr. Boddington succeeds A.V-M. P. S. Blockey, C.B., C.B.E.

SARO's Saucer

FOR many months it has been acknowledged that Saunders-Roe Ltd. have been picked by the National Research Development Corporation to build an experimental prototype of a novel form of air-supported vehicle to explore principles suggested by Mr. Christopher Cockerell, a Lowestoft boat-builder (a reference to the project appeared in our June 6, 1958, issue). Unofficial reports have now appeared describing this craft in some detail and stating it is known as the Hovercraft, is being managed by the Hovercraft Development Co. Ltd. and will be launched on Southampton Water early in June. Saunders-Roe are anxious to make no official statement at this time, since the revelation of the many commercial secrets involved would prejudice their chance of exploiting the principles.

Defence and Technology

SPEAKING at the eleventh annual dinner of the Senior Common Room at the College of Aeronautics, Cranfield, last Friday, Sir Christopher Hinton said that technology was advancing too fast to be absorbed into this country's economic and social system, and defence expenditure was mainly to blame. Sir Christopher, who is chairman of the Central Electricity Generating Board, suggested that this pace forced engineers to depend too much on scientists, which was undesirable. Defence applications were the primary reason for the fact that over 30 per cent of the net revenue of the aircraft industry was devoted to research and development—a much higher proportion than for any other industry except that of nuclear energy.

Another official guest at the dinner, Mr. H. B. Irving, spoke of the valuable research into jet noise suppression carried out by

ANNUAL PRESENTATIONS of the Guild of Air Pilots and Air Navigators were made in London on April 2. From left to right, receiving their presentations from the Master, Sir Frederick Tymms, are: Mr. H. A. Purvis and W/C. A. H. Gibb, representing A. and A.E.E. (Johnston Memorial Trophy—for the flight development of Dectra); Mr. John L. Watkins, T.A.A. (Cumberbatch Trophy—for airline safety); Capts. D. Anderson, A. S. M. Rendall and R. E. Millichap, representing B.O.A.C.'s Britannia 102/312 and Comet 4 flights (Brackley Memorial Trophy); Mr. Tom Brooke-Smith, Short Bros. (Derry and Richards Memorial Medal—for test-flying work); and Mr. Brian Trubshaw, Vickers (Award of Merit)

"Flight" photographs

Young, Lilley and Westley at Cranfield; and referred also to man-powered flight. The Man-powered Aircraft Committee which was originally formed at a meeting at the College, he said, was on the point of becoming a specialized group within the Royal Aeronautical Society; and several private-venture man-powered aircraft projects were already "in quite an advanced state" in this country.

Two members of the academic staff of the College also made effective and amusing speeches at the dinner. They were Prof. A. J. Kennedy of the Department of Metallurgy, and Mr. J. R. Palmer, deputy head of the Department of Aircraft Propulsion.

A Living Transport Museum

LAST Sunday, April 5, Lord Brabazon of Tara opened a new extension to the Montagu Motor Museum at Beaulieu, Hants. The new buildings bring under one roof, so to speak, about 200 cars and motor cycles, bicycles, engines and, in the words of a Press release prepared for the occasion, "horse drawn and commercial vehicles, two trams and a Spitfire."

The Spitfire—a Mk 16—was presented by Mr. M. Wilcock of Worthing, who acquired it in December 1954. It had been used after the war by Air Chief Marshal Sir James M. Robb on his duties as Commander-in-Chief Air Forces Western Europe, and last flew on duty on November 30, 1953. It is finished in P.R. blue and still bears the air chief marshal's five stars.

Italian Visitors

FROM April 20 to 25 a Piaggio P.166 Executive (I-PIAK) and a P.136L (I-GULL) will be on view in this country. They are to be based with the aviation division of Sir Robert McAlpine and Sons Ltd. at Luton Airport, where they will be available for inspection and for flights by invitation. On the Thursday and Friday they are attending the W. S. Shackleton Ltd. sales week-end at Kidlington Aerodrome, Oxford. The pilots of the two aircraft, which on April 26 are flying to the Hanover Fair, will be the Marchesa Carina Negroni (holder of the distance record for amphibians with a Piaggio P.136L) and Commandante Aldo Gasperi, chief test pilot of Piaggio. Ing. Pietro Ruggeri, an executive of the experimental department, and Dr. Ing. Bruno Mori, technical sales executive, are accompanying the aircraft.

New Fairey Boards

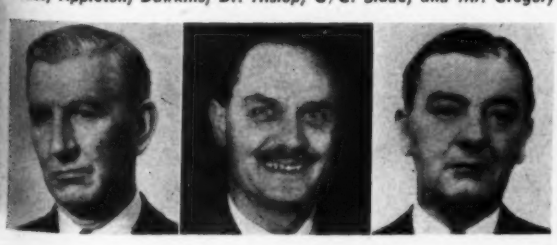
FOLLOWING the reorganization of the Fairey Aviation Co. Ltd. into a holding company and subsidiaries (*Flight*, March 13), the Fairey Co. Ltd. has announced that its change of name from Fairey Aviation does not alter the constitution of its Board. This remains as follows: Mr. G. W. Hall, F.R.Ae.S. (chairman and managing director); Mr. R. Fairey (vice-chairman); Mr. C. H. Chichester Smith, D.S.C., A.F.R.Ae.S.; Mr. R. L. Lickley, B.Sc, D.I.C., M.I.Mech.E., F.R.Ae.S.; Mr. J. C. Macpherson, A.C.A., and Mr. A. Vines, A.F.R.Ae.S., A.M.I.P.E.

But new appointments to the Boards of Fairey Aviation Ltd. and Fairey Engineering Ltd. have been announced. The aviation company's directors are as follows: Mr. C. H. Chichester Smith (chairman); Mr. R. L. Lickley (managing director); Mr. J. C. Macpherson; Mr. A. Vines; Mr. L. R. E. Appleton, O.B.E., M.A., M.I.Mech.E., F.R.Ae.S.; Mr. L. S. Dawkins; Dr. G. S. Hislop, Ph.D., B.Sc., A.R.C.S.T., M.I.Mech.E., F.R.Ae.S.; and G/C. R. G. Slade, O.B.E. The Board of the engineering company is: Mr. C. H. Chichester Smith (chairman); Mr. A. Vines; Mr. H. G. Gregory, M.I.P.E. (general manager); Mr. L. R. E. Appleton and Mr. L. S. Dawkins.

Mr. C. H. Chichester Smith has been a director of the Fairey Aviation Co. for 16 years, having been invited by the late Sir Richard Fairey to join the Board in 1943, when he was Controller of the Burtonwood Repair Depot. Mr. R. L. Lickley joined the company in 1951 and in 1956 was appointed technical director, assuming overall responsibility for the Rotodyne. Mr. L. R. E. Appleton has been chief engineer of the Fairey Weapon Division since 1950 and has been in charge of all weapon projects including Fireflash. Mr. L. S. Dawkins joined the company in 1936 and was appointed secretary in 1956. Dr. G. S. Hislop came to the company from B.E.A. in 1953 as chief designer (helicopters) and was appointed chief engineer (aircraft) in 1958. G/C. R. G. Slade was appointed superintendent of flying in March 1957, having been the company's chief test pilot since 1946.

***AERODYNE BY LIPPISCH:** A full-scale model of the Aerodyne VTOL aircraft with its designer, Dr. Alexander Lippisch. Built by the Collins Radio Company and jointly sponsored by the U.S. Army and Navy, it utilizes channelled airflow from contra-rotating internal propellers*

***NEW FAIREY DIRECTORS,** referred to above, are (left to right, top row) Messrs. Chichester-Smith, Lickley, Macpherson; (below) Messrs. Vines, Appleton, Dawkins, Dr. Hislop, G/C. Slade, and Mr. Gregory*



IN BRIEF

Mr. Michael Bingham, a senior director of the Microcell Group, died on April 3 at the age of 61. Before entering industry he was well known as a professional golfer, winning many trophies.

* * *

A Convair 880 flight simulator has been ordered by Swissair from Redifon Ltd., of Crawley, Sussex. Planned utilization is about 3,000 hr per year at an operational cost stated to be 15 or 20 times less than that of flying training in the aircraft.

* * *

One of the three S.B.A.C. members exhibiting in the British pavilion at the Leipzig Spring Fair was Amplivox Ltd., who demonstrated a range of aircrew and lightweight A.T.C. headsets and new fully tropicalized earphone and microphone insets which were developed for the R.A.E. Farnborough. Particular interest was shown in the insets by East German visitors to the stand, and those who had an opportunity of testing the headsets said that the Series H were superior in speech reproduction quality to any they had heard before. These instruments incorporate a boom arm designed for B.E.A. and a tropicalized noise-cancelling magnetic microphone developed for the R.A.E. The noise reduction attained by this microphone especially impressed the visitors.

* * *

Today's (April 10) issue of *The Autocar* is the annual Sports and Racing Car Number. Features includes finely illustrated descriptions of modern high-performance cars and practical articles for the enthusiast. Another *Autocar* publication now current is *Road Tests, Spring 1959* (price 6s, or 6s 8d by post, Iliffe & Sons Ltd.), giving test reports on 21 cars of various nationalities.

Prime Ministerial Visit

CRANWELL AND COTTESMORE AT HOME TO MR. MACMILLAN

ILLUSTRATED WITH "FLIGHT" PHOTOGRAPHS

TO mark the 41st anniversary of the Royal Air Force the Prime Minister paid a visit on Wednesday of last week to two of its most important institutions, the R.A.F. College and a V-force station. At Cranwell he took the salute at a ceremonial parade which for disciplined precision rivalled anything by the Brigade of Guards; and at Cottesmore he set in motion that distinctively R.A.F. operation a V-bomber scramble, seeing four Victors of Nos. 10 and XV Squadrons get airborne in the record time of 3 min 57 sec.

When Mr. Macmillan arrived at Cranwell from Gatwick by Comet 2 of Transport Command, there was some low frontal cloud and a chill in the air. But as he walked on to the parade ground accompanied by the Commandant (A. Cdre. D. F. Spotswood) and the Assistant Commandant (G/C. H. N. G. Wheeler) the sun burst through and shone with comforting brightness; and the 16 Vampire T.11s of the Advanced Flying Wing which came in from the east in boxes of four at 350ft could hardly have needed the sodium lights on the College tower.

Mr. Macmillan, who as a military man obviously enjoyed the cadets' brisk manœuvres, said at luncheon how moved he had been to hear his own regimental march (*The British Grenadiers*) played as accompaniment to the quick march-past. He had been introduced by the Chief of the Air Staff, Marshal of the R.A.F. Sir Dermot Boyle, who said what a tribute it was to his Service and to the College that the Prime Minister (the first to visit Cranwell) should have found time to come "in the midst of his great endeavours."

The Prime Minister put into words what many perhaps were thinking as they watched the parade that morning, when in referring to 1940 as the greatest year in the history of the R.A.F. he added that most of the marching cadets had not then been born.

War, he said, was a bad thing; but in the last resort freedom depended on men being willing to die for it. The last war had crystallized our trust in the R.A.F.; qualities which had been shown then were the ones needed today. In its short history the R.A.F. had created unequalled traditions.

Referring to the C.A.S.'s comment that he was the first Prime Minister to come to Cranwell, Mr. Macmillan added that he was perhaps only just in time—"one never knows."

Responsibilities which the R.A.F. had assumed would not grow less, but more. It had a vital part to play in the deterrent force, in providing forces for local wars, in the job of showing the flag. It would play as great a rôle in the future as in the past. Methods and weapons were changing rapidly, but basic military principles did not change. For as far ahead as we could see, pilots and crews had a future. If the space age should come, there was no doubt that the R.A.F. would supply the manpower.

Mr. Macmillan gave the College two bits of encouraging news for itself, that it was to have a permanent instructional block and that the main building was to be completed by adding a fourth wing, "for which you have been waiting so long."

After paying tribute to the R.A.F., which by the quality of its flying had done much to help the aircraft industry, and saying he was quite sure they were right to make it an all-regular force, Mr. Macmillan said it was our task to give the R.A.F. the best equipment: he wished all its members Godspeed and the best of luck. Then, having planted a tree as a tangible and lasting reminder of his visit, the Prime Minister was whisked over to Cottesmore in his Comet 2.

Thus, after seeing the R.A.F.'s chief training establishment, he went straight into its front line, so to speak—at the base of two of the Victor squadrons, Nos. 10 and XV, of the V-force. He was welcomed by the A.O.C-in-C. Bomber Command, Air Chief

On his arrival at Cranwell for the ceremonial parade (picture at left, above) the Prime Minister is greeted by a low-level fly-past by sixteen Vampire T.11s flown by College instructors

With feet barely touching the ground, W/C. D. Green and his crew (at left) make for their aircraft after Mr. Macmillan had initiated a Victor "scramble" at Cottesmore

A thoughtful Prime Minister (above) leaves the cockpit of the Lightning, accompanied by S/L. J. Dell, who is wearing partial-pressure clothing; and (at right) Mr. Macmillan studies Firestreak—the first seen publicly—in company with Air Chief Marshal Sir Harry Broadhurst and F/L. I. Keppie, pilot of the Javelin

Marshal Sir Harry Broadhurst, by the A.O.C. No. 3 Group, A.V-M. K. B. B. Cross (Sir Harry's successor-designate as C-in-C.), and by the station commander, G/C. J. E. ("Johnny") Johnson, who was the R.A.F.'s top-scoring fighter pilot in the last war.

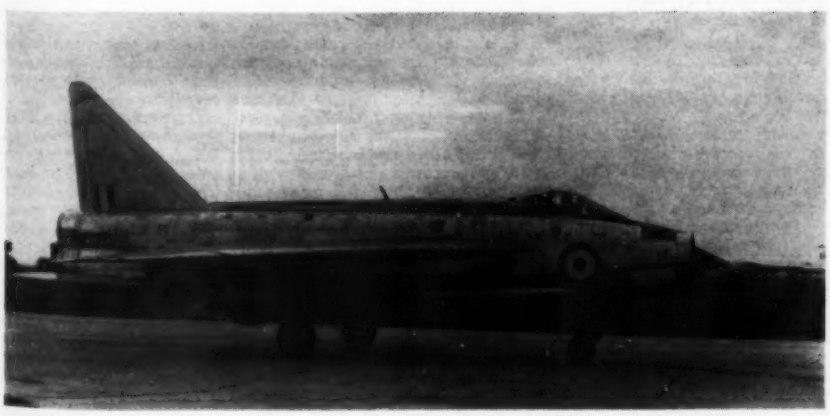
The Prime Minister went first to the electronics centre and was there given a presentation on air transport operations, a demonstration of the navigation bombing system and a briefing on the V-bomber dispersal plan. In a hangar he saw a Bloodhound on its transporting trolley; a model layout of a S.A.G.W. station; a stand-off bomb; a model of a Thor launching site; and models of Blue Streak.

Then on the airfield he inspected a static display of some of the R.A.F.'s new and incoming aircraft—the second A.W. Argosy; an English Electric Lightning; a Blackburn Beverley C.1 of No. 53 Sqn., loaded with a jeep and with six paratroopers in their full battle equipment; an Avro Shackleton M.R.3 of No. 201 Sqn.; a Gloster Javelin FAW.7 from No. 1 G.W.D.S. at R.A.F. Valley, armed with real Firestreaks (the first time this weapon had ever been seen publicly); a Bristol 192 which had been flown over by "Sox" Hosegood and Lt-Cdr. Dan Farquhar from Weston-super-Mare; and a Handley Page Victor of No. XV Sqn. The Lightning, piloted by S/L. James Dell, did a demonstration take-off and disappeared into the now-infinite blue skies; then the Argosy, flown by the A.W.A. chief test pilot, Mr. Eric Franklin, also took off but came back along the runway in a sedate low-level run before departing for Bitteswell.

The Prime Minister then moved over to the operations caravan at the end of the main runway, at the other side of which four Victors were parked, two each from the resident squadrons. Now came the afternoon's great moment, when Mr. Macmillan pressed the warning buzzer for the Victors to scramble.

The crews raced across the runway to their aircraft, which gleamed white in the afternoon sunshine; the first careered on to the runway like a racing car and was airborne in 2½ min from the time the buzzer sounded; and all four were in the air in three seconds under four minutes.

Truly an impressive demonstration of V-force training, and a sight which must have given the Prime Minister some food for global thought during his return flight to Gatwick in the Comet.



Mr Macmillan with his R.A.F. hosts (second from top): from left to right, Marshal of the R.A.F. Sir Dermot Boyle, C.A.S.; A. V-M. K. B. B. Cross, A.O.C. No. 3 Group; Air Chief Marshal Sir Harry Broadhurst, A.O.C.-in-C. Bomber Command; and G/C. J. E. Johnson, station commander, Cottesmore. Immediately above, the Prime Minister meets members of the 16th Independent Parachute Brigade by a Blackburn Beverley of No. 53 Sqn.

At left, S/L. Dell (whose partial-pressure helmet can just be distinguished) taxies out in the Lightning for a demonstration take-off from Cottesmore

Nike Hercules surface-to-air missile systems for the U.S. Army are produced at the Charlotte, North Carolina, plant of Douglas Aircraft. The finished airframe sections go through their final check-out and assembly sequences suspended from an overhead monorail

Missiles and Spaceflight

BLUE JAY UNCAGED

The de Havilland Propellers Blue Jay air-to-air missile now officially known as Firestreak, had until last week been publicly displayed only in mock-up form. As related in a leading article and shown in a photograph on p. 483 it has now been exhibited in its genuine operational form.

The nose is formed from eight flat panels of heat-resisting glass, capable of standing up to the high aerodynamic loads and erosive material in the atmosphere (such as rain) at Mach 2, while remaining transparent to the infra-red radiation from the target over an included angle of at least 60 deg. Behind the homing head are a pair of broad rings around the body, the mid-point of the first being some 17in from the tip of the nose and the second being 19in further aft. Each is clearly a strong forging, carrying all flight loads, but perforated by twelve apertures around its circumference. Beneath each ring is a further infra-red system, capable of looking at the target through 360 deg around the longitudinal axis of the missile.

It seems clear that, the nose seeker having steered the Firestreak close up behind its quarry, these two rings of heat-sensitive cells lock-on to the target and feed in two continuous series of angular signals similar to those obtained from optical range-finding systems. Thus the precise bearing and range of the target is recorded during the final run-in, and the warhead (which is obviously located behind the wings, around the motor tube) is detonated as soon as the range starts to increase from the minimum value (the miss distance), or by impact fuzes in the event of a direct hit.

X-15's SECOND CAPTIVE FLIGHT

The first flight of the first North American X-15 hypersonic research aircraft took place on March 10 when the aircraft was taken into the air beneath the wing of its B-52A mother ship, with Scott Crossfield in the cockpit (picture March 20, page 370). A number of minor difficulties were experienced and on the return of the linked aircraft to Edwards A.F.B. some modifications were made to the instrumentation and other systems. A second flight took place on April 1; on this occasion the X-15 and its mother ship were airborne for 105 min and the aerodynamic qualities of the combination and a number of the instrumentation and power systems were subjected to initial evaluation. Within a few days Scott Crossfield may be able to accomplish the first separation, followed by a glide (with the propellant tanks empty) from an altitude of some 35,000ft. Powered flights should begin in the summer.

BRITON TO MANAGE DISCOVERER PROGRAMME

It was announced earlier this month by the Lockheed Aircraft Corp. that Mr. Roy Smelt has been appointed manager of the Discoverer satellite programme, for which the company's Missiles and Space Division is the prime contractor. Mr. Smelt left Cambridge University to join the R.A.E. as an aerodynamicist, pioneering the arc-driven tunnel and being at one time head of the G.W. Department. In 1948 he became deputy chief of the aeroballistic research department at the U.S. Naval Ordnance Laboratory and then spent seven years as chief of the gas dynamics department at the vast U.S.A.F. Arnold Engineering Development Center at Tullahoma, Tenn. While here was co-author of *Jets and Rockets*, a book published last month. He joined Lockheed in 1957.

The Discoverer programme is sponsored by the U.S.A.F. Advanced Research Projects Agency to prepare the way for manned spaceflight. The first package, weighing 1,450 lb, went into north-south orbit from Vandenburg A.F.B. on February 28. A total of 19 rounds are expected to be fired in the Discoverer series. Some of the flights will carry bio-medical specimens and recovery capsules.

RETURN TRIP TO VENUS

The news that U.S. scientists succeeded last year in transmitting a radar signal to the planet Venus and receiving the return echo on earth was announced on March 19. The achievement, which involved transmission over a total distance of some 56 million miles, was made by personnel of the Lincoln Laboratory of Massachusetts Institute of Technology in February 1958. The radar signal was reported to have taken approximately 2½ min to reach Venus (from an 84ft dish antenna at Westford, Massachusetts) and about the same time to return, but over a year's analysis had been needed to prove the experiment's success. Improved accuracy in measuring interplanetary distances is a major result of the test.

MARCONI'S EVA

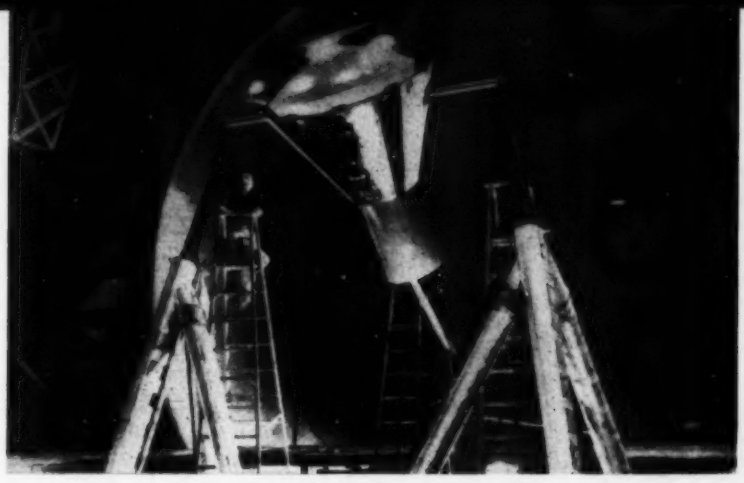
It was announced last month by Marconi's Wireless Telegraph Co. Ltd. that the M.o.S. have ordered six electronic velocity analyzer equipments (EVA). These devices have been designed for measuring the velocity of any flying projectile, the accuracy being within ±1ft/sec up to more than 3,000ft/sec.

Marconi say, "Accurate and readily assessed figures are recorded graphically on electrically sensitized paper. The versatility of the equipment eliminates the need for the intricate systems of instrumentation formerly employed for velocity tests. EVA will record instantaneous changes in velocity which are often undetectable by other means. The record is obtained on moving Teledeltos paper and is presented as a continuous graphical representation of events recorded against a reference of timing marks representing fractions of a second. An event marker is also provided, and additional recording arms may be fitted if required."

The M.o.S. order is the first to be placed for the new equipment, which is likely to find wide application. The six equipments bought will be employed in weapon velocity measurements by the Royal Artillery, and by the Department of the Chief Superintendent of Ranges (who is responsible for the M.o.S. Proof and Experimental Establishments).

A SPACE PRIMER

A neatly produced 72-page Space Primer has been prepared by the Convair (Astronautics) Division of General Dynamics Corporation "to answer the most-often-asked basic questions about space flight, to provide a standard definition of terms and to guide students who want to do further reading in astronautics." The Primer was published in January and, as might be expected, can be regarded as absolutely authoritative. It is extremely difficult to produce a work of this nature without either being patronizing or going over the heads of most of the likely readers. Convair seem to have succeeded admirably in deciding what sort of publication is required, what type of field must be covered and how the material should be put across. Newton's laws of motion, systems of propulsion, the solar system and careers in astronautics are a few of the major sub-divisions and the bibliography, although virtually wholly American, is unusual in such a booklet. The Space Primer is being offered at cost to schools throughout the U.S.A. and could doubtless be obtained upon written request from any educational authority in this country. Requests should be addressed to Department 120, Convair Astronautics, P.O. Box 1128, San Diego 12, California.



Missiles and Spaceflight . . .

PROJECT MERCURY

TO place a manned space capsule into orbital flight around the Earth, to recover successfully the capsule and its occupant, and to investigate the capabilities of man in this new environment are the stated objectives of the manned satellite programme known as Project Mercury. The U.S. National Aeronautics and Space Administration is responsible for the management and technical direction of the project, with the advice and assistance of the Defense Department's Advanced Research Projects Agency, and it was announced in January that McDonnell Aircraft Corp. had been chosen for the design, development and construction of the capsule. As indicated by the two photographs at the top of this page, the testing of early models has begun.

NASA work on the concept of a manned satellite began during the first week of October last, when a space task group was set up under Robert R. Gilruth as project manager. This group, which reports directly to Dr. Abe Silverstein, the NASA Director of Space Flight Development, is located at the Langley Research Center, Langley Field, Virginia.

The proposed flight-plan for the satellite is described by NASA as follows: (1) An ICBM rocket booster will launch the manned capsule into orbit; (2) a nearly circular orbit will be established at an altitude of roughly 100 to 150 statute miles to permit a 24-hour satellite lifetime; (3) descent from orbit will be initiated by the application of retro-thrust rockets incorporated in the capsule system; (4) parachutes, incorporated in the capsule system, will be used after the vehicle has been slowed down by aerodynamic drag; (5) recovery on either land or water will be possible.

According to the specification, the satellite will have high aerodynamic drag and will be statically stable over the Mach number range corresponding to flight within the atmosphere. It will be of the non-lifting type, and designed to withstand any known combination of acceleration, heat loads, and aerodynamic forces which might occur during boost or re-entry. The capsule will have an extremely blunt leading face covered with a heat shield. The "life support system" utilizes a fitted couch to support the pilot during acceleration; pressure, temperature and composition of the atmosphere in the capsule will be controlled; and food and water will be provided.

Attitude control will be based on a closed-loop system consisting of an attitude sensor with reaction controls. These controls will maintain the vehicle in a specified orbital attitude and will establish the proper angle for retro-firing, re-entry or an abort manœuvre. The pilot will be able to select manual or automatic control during orbital flight.

A "retrograde system" will be provided which will supply sufficient impulse to permit atmospheric entry in less than half an orbital revolution after application of the retro-rockets. These rockets will be fired on a signal either from ground control or by the pilot himself, and thus the impact area can be pre-determined.

As the capsule re-enters the Earth's atmosphere and slows down to approximately Mach 1, a drogue parachute will open to stabilize the vehicle. At this time radar foil will be released to indicate the position of the capsule. When the velocity has decreased sufficiently a landing parachute will open, at an altitude high enough to permit a safe landing on land or water. (The capsule will be buoyant and stable in water.) After landing, recovery will be assisted by tracking beacons, a high-intensity flashing light system, two-way voice radio and dye markers.

In case of an emergency before orbital altitude is reached, escape rockets will be used to separate the capsule from its booster,

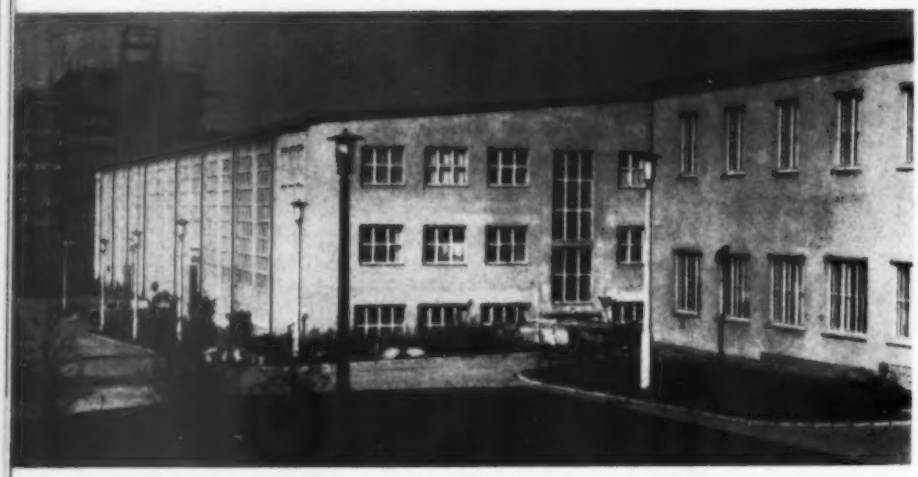
Early stages of Project Mercury development are depicted in the two heading photographs: (left) a capsule mock-up which was air-dropped last month, and (right) an aerodynamic model being positioned in the full-scale tunnel at the NASA research centre at Langley, Virginia, prior to determination of lift, drag and static-stability characteristics. Above, NASA administrator Dr. T. Keith Glennan (left) and J. S. McDonnell with a model of the capsule. Right, artist's impression of the use of escape rockets to separate capsule from booster

as illustrated in the sketch (right). When in orbit, the pilot can re-enter the atmosphere at any time by firing the retro-rockets, and other safety control features will be incorporated.

Guidance and tracking equipment to guide the capsule into the desired orbit will include both ground-based and booster-carried units. Ground and capsule equipment will then determine the orbital path of the vehicle throughout its flight, and will be used to initiate descent at the proper time and to predict the impact area. Provision will be made for two-way radio communication between the pilot and ground stations during flight, and equipment will include a two-way voice radio, a receiver for commands from the ground, telemetry equipment for the transmission of data from the capsule to the ground, and a radio tracking beacon. All electronic equipment is by Collins Radio Co.

The instrumentation carried will comprise (1) medical instrumentation to evaluate the pilot's reaction to spaceflight conditions such as weightlessness and high acceleration and deceleration, and (2) equipment to measure and monitor the internal and external capsule environment and to make scientific observations. The first orbital flight of a manned capsule will take place only after a prolonged programme of development, which includes ground testing, qualification flight testing and pilot training. Twelve candidates for occupancy of the first manned capsule to be launched were to have been selected, from 110 volunteers, by the end of last month.

The total cost of the satellite capsule and its sub-systems is expected to exceed $15 million. McDonnell Aircraft was selected after proposals from 12 companies had been evaluated by NASA.



The VEB Entwicklungsbau; administrative offices can be seen under construction

East German Engine Industry

A VISIT TO THE PIRNA WORKS

By
Cdr. Edgar P. Young, R.N.(Retd.)

FOUNDED in the winter of 1954-55, and as yet by no means completed, VEB Entwicklungsbau, at Pirna, near Dresden, today employs some 3,000 people. It manufactures only turbojets, piston engines being the responsibility of VEB Industriewerk, of Karl-Marx-Stadt (formerly Chemnitz). The initials VEB stand for *Volkseigener Betrieb*, or publicly owned enterprise.

Development as rapid as that of the Pirna works has been made possible only by the fact that the Government of the German Democratic Republic, having decided that the development of an aircraft industry was desirable, made adequate capital available for its speedy and unhampered expansion. Even so, in the circumstances obtaining in Germany after the war this development would have been difficult if a core of skilled workers had not been available from the outset. This consisted of former workers for Junkers and B.M.W., who had been captured by the Russians and put to work on aircraft production in the U.S.S.R. Round this core of key personnel has been built up the large body mentioned above, consisting of young men and women (in almost equal proportions) who have been trained in the numerous technical schools and colleges established by the Government of the German Democratic Republic in anticipation of the growing demands from fast-expanding industry of all kinds. Senior staff come largely from the Technische Hochschule (Technical High-school) at Dresden, which has now some 10,000 full-time students in its various faculties (which include aerodynamics and mechanical engineering), plus a further 15,000 or so doing correspondence courses for what is equivalent to our Diploma in Engineering.

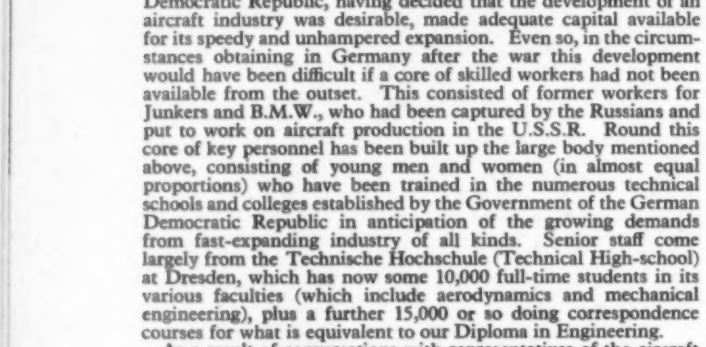
As a result of conversations with representatives of the aircraft industry at the Leipzig Spring Fair, where that industry was exhibiting prominently, I was afforded every facility for a visit to the Pirna establishment. There were no restrictions, apparently, as to what I might see (though I was not allowed to take photographs) and all my questions were fully and frankly answered.

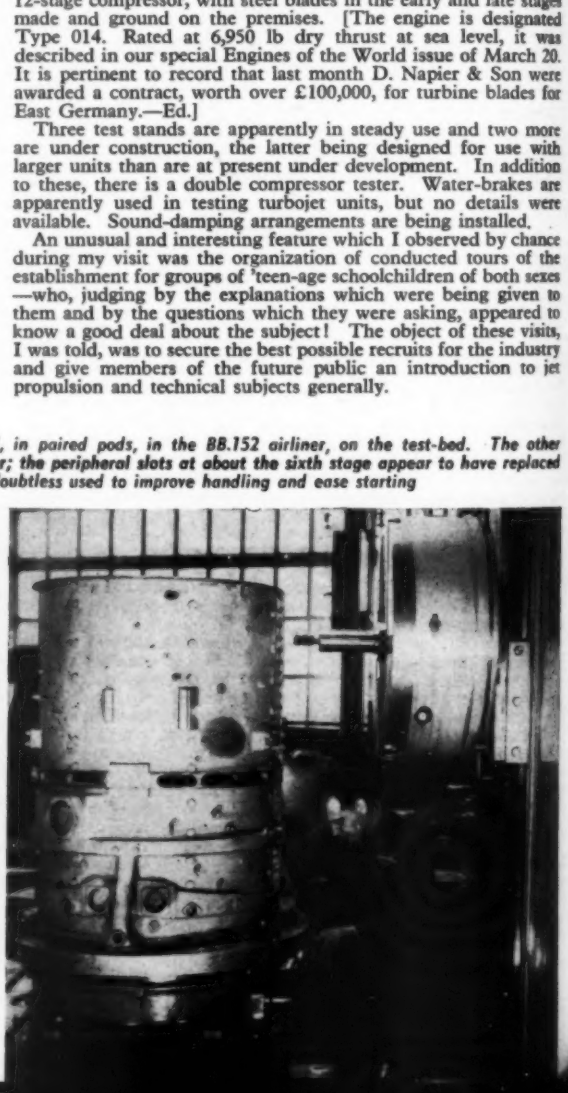
Work proceeding at the present time is the development of a turbojet unit based on a Soviet design, but improved on by the German designers. This is being tried out in the BB.152 airliner [described in *Flight* for March 27] which is being developed as fast as possible. It has a 12-burner combustion chamber and 12-stage compressor, with steel blades in the early and late stages made and ground on the premises. [The engine is designated Type 014. Rated at 6,950 lb dry thrust at sea level, it was described in our special Engines of the World issue of March 20. It is pertinent to record that last month D. Napier & Son were awarded a contract, worth over £100,000, for turbine blades for East Germany.—Ed.]

Three test stands are apparently in steady use and two more are under construction, the latter being designed for use with larger units than are at present under development. In addition to these, there is a double compressor tester. Water-brakes are apparently used in testing turbojet units, but no details were available. Sound-damping arrangements are being installed.

An unusual and interesting feature which I observed by chance during my visit was the organization of conducted tours of the establishment for groups of 'teen-age schoolchildren of both sexes —who, judging by the explanations which were being given to them and by the questions which they were asking, appeared to know a good deal about the subject! The object of these visits, I was told, was to secure the best possible recruits for the industry and give members of the future public an introduction to jet propulsion and technical subjects generally.

On the left, below, is seen a Type 014 turbojet, of the type installed, in paired pods, in the BB.152 airliner, on the test-bed. The other picture shows a compressor casing being indexed on a horizontal borer; the peripheral slots at about the sixth stage appear to have replaced the blow-off valves fitted to early engines and are doubtless used to improve handling and ease starting





UNINVITED ELECTRICITY

STATIC AND LIGHTNING IN RELATION TO AIRCRAFT

By LIONEL G. HILL, D.F.H.

MOST people in the aircraft industry and a great many outside are aware of the problems which arise from static electrical charges accumulating on parts of the aircraft structure and the potential hazards which accompany lightning discharges on or in the vicinity of aircraft in flight. Surprisingly, very little appears to be generally known within the industry concerning these phenomena and many of the regulations and preventative measures which are in current use reflect this ignorance to a large degree.

We say "surprisingly" because the fundamentals of static generation and accumulation have been established for nearly a century and are detailed in most of the early textbooks on electricity and magnetism, while the basis of lightning discharges and protection was known even earlier in connection with lightning-conductor installations on buildings. The extent to which this lack of knowledge exists is demonstrated in the wide divergence of views between American and British authorities on the maximum resistance of bonds which can be allowed to eliminate static interference in radio and communication channels on an aircraft. While present British requirements call for a maximum of 0.05 ohm per bond, the corresponding American recommendation is no less than 500,000 ohms.

Causes of Static Build-up. Static electricity differs from current electricity in that it is possible to have a positive or negative charge on a body without a corresponding charge of equal and opposite polarity in the vicinity. A static charge on a body can be either generated by friction with another body initially at the same potential, transferred from another body at a higher potential by contact, or induced by the close proximity of another body at a different potential though not in actual contact.

Static charges can appear on both insulating and conducting materials—with one slight difference in behaviour. On conducting materials the whole body is at an equipotential level of charge and the discharge of static energy from one point effectively discharges the whole. On insulating materials static charges are local, and the "drawing" of a static charge from one area does not affect that on an adjacent area. The pattern of static charge on a sheet of insulating material can be shown by sprinkling fine dust over the charged surface and blowing the surplus away (the dust accumulation on fluorescent-lighting diffusers is an excellent illustration). There are, of course, intermediate patterns of behaviour on materials which are neither perfect insulators nor perfect conductors.

Friction-generated Static. If two bodies are rubbed together, the energy of friction is converted partly to heat and partly to an electrical charge. The heat is rapidly transferred to the surrounding atmosphere by conduction: the electric charge remains static on the two bodies at opposite potentials, positive and negative. The "quantity" of the static charge will be a function of the materials, the contact-pressure and the relative velocity. The charge potential will depend upon the size of the body in broad relation to the frictional contact area, and the relative polarities will be related generally to the materials (though the laws governing this are still imperfectly known).

Transfer of Charges by Contact. If two bodies at different static potentials are brought into contact, a transfer of charge sufficient to equalize the potentials will take place between the two bodies as a flow of current. This will take place between bodies of the same polarity at different potentials, between bodies of the same potential at different polarities (the potential here being related to earth) or a combination of both. The magnitude of the current will depend upon the potential difference and the capacity of the smaller body.

A small body at high potential may therefore discharge into a larger body at lower potential without appreciably increasing the potential of the latter, but a large succession of such discharges from a number of small bodies will serve to raise the potential of the larger body until it, too, is at the same potential when no further transfer will take place. This is the principle underlying the operation of electrostatic generators such as the Wimshurst and van de Graaf machines.

Induced Static Charges. If a highly charged body is brought close to, but not in contact with, another body it will induce a temporary charge of the opposite polarity on the uncharged body and the induced static potential will add to or subtract from any potential on the charged body so long as it is in the vicinity. The potential of the induced charge will depend upon the initial difference of potential between the two bodies and the distance between them.

Static Charges in the Atmosphere. The atmosphere must be considered as a combination of gas molecules, water vapour or droplets and fine solid matter or dust, all in a state of continuous motion. There is, therefore, a continuous interchange of static charges from the constituent particles by contact and also by generation of fresh charges by friction. In the upper levels of the atmosphere static generation is also effected by ionic bombardment from the sun and there is, in addition, reason to believe that at lower levels the presence of shorter ultra-violet waves may also be a contributory factor.

These particles, and in particular water vapour and dust, may combine to form masses on which the static potential can be appreciably above that of adjacent similar masses. By an increase in the potential difference through the addition of further charges, or by an increase in the potential gradient between the masses through relative movement, the intervening space will ultimately break down and an equalizing transfer will take place which, if of sufficient magnitude, will become visible as a flash of lightning.

Lightning Discharges and Associated Phenomena. A great deal of research has taken place into the various forms of lightning discharge. The most common are the so-called sheet, fork and ribbon lightning. Less-frequent forms are known to exist, though little is known about their cause or structure mainly because they occur so infrequently and then rarely in the presence of observers skilled in assessing the probable localized conditions. Ribbon and fork lightning are respectively referred to by the lightning technologist as A and B flashes. Sheet lightning is invariably the reflection on the clouds and upper atmosphere of ribbon and fork lightning out of direct sight of the observer.

Ribbon Lightning. Ribbon lightning (A flashes) occurs from cloud to cloud or cloud to earth as a single bluish-white discharge of irregular path. Electrically it is a single, steep-fronted D.C. discharge at a very high voltage followed by an oscillatory train rapidly attenuating both in peak value and wave length. The voltage of such a discharge is measured in millions but the current is relatively small, usually of the order of a few amperes. The single discharge normally results in such a rapid rearrangement of the pattern of static potentials in the neighbourhood as to trigger off a series of secondary discharges from other charged masses. Some of these take the low-resistance ionized path of the first flash and to the eye, and sometimes even to the fastest cameras, appear as a tree formation of simultaneous discharges.

The A flash is always preceded by a corona discharge from sharp edges or points either on the clouds, on objects suspended

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in the atmosphere (aircraft, etc.) and on the surface of the earth. This corona discharge is first invisible and silent but, as the potential difference increases, it becomes visible as a bluish brush discharge and audible as hissing. The discharge has the effect of reducing the static charge on the mass and may succeed in reducing it to a safe point without further effect. Alternatively it may, by producing a rapidly extending channel of ionized gas and/or by building up a path of chains of solid particles in the atmosphere, prepare the way for a lightning flash.

This corona discharge is most noticeable in hot, dry and relatively clean climates, or at high altitudes at lower atmospheric pressures. One of the popular names by which it is known is St. Elmo's Fire. The discharge is greatest at areas of high potential gradient, such as sharp edges and points, and these pave the way for the subsequent lightning discharge by lowering the resistance of the path. Almost invariably A flashes choose a sharp point as the terminal of the discharge, even though an alternative terminal without a point would provide a shorter path. For this reason a pointed lightning conductor gives protection. Few A flashes cause any direct damage, owing to their low current value.

Fork Lightning. Fork lightning (B flashes) is the result of two or more simultaneous cloud to cloud and/or cloud to earth discharges. They are shorter and thicker than A flashes and are more usually reddish in colour.

The sequence preceding a B flash is as follows. A potential is building up between a cloud mass and the earth but has not reached an ionizing (corona) stage. An approaching cloud mass at a higher potential raises the gradient between the two masses until ionization commences. This is assisted by the induced secondary potential on the first mass, which temporarily reduces the potential gradient between it and earth. Ultimately a discharge takes place between the two masses as an A flash, which has the effect of not only restoring the potential difference between the first cloud mass and earth but also boosting it instantaneously by several million volts. The subsequent discharge between this mass and earth is not preceded by a corona discharge, and the lowering of the potential of the cloud mass by this discharge has the effect of continuing the discharge from the second cloud mass at a greatly increased rate.

These two discharges are B flashes, and the current from such a discharge can rise to many thousands of amperes and is highly destructive. Moreover, not being preceded by ionization of the intervening air space, it takes the shortest path and is not point-selective in its terminations. In lightning-conductor work it is recognized that, to give effective protection from both A and B flashes, the pointed conductor tip must be set higher than surrounding objects.

Side Flashes and their Prevention. Although the initial discharge of a lightning flash is a single D.C. pulse, the wave front is so steep (i.e., the rate of increase of current is so rapid) that for impedance purposes it behaves as a V.H.F. transmission. No matter how low the ohmic resistance of the conductor path from the termination to the terminal mass, if it incorporates sharp bends the discharge will ignore them. Instead it will flash over, either to the next nearest point in a straight line on the conductor or to an adjacent conducting path which, in terms of ohmic resistance, may be many times that of the intended path but has a lower H.F. impedance. A great deal of unnecessary damage has been caused by failure to observe this simple fact. All bonds and conductors which are incorporated for lightning protection *must* be as short and straight as possible. Their ohmic resistance is of secondary importance.

Frequency of Lightning and Corona Discharges. In this country one is inclined to look upon lightning as a comparatively rare event; in fact, for any one area the number of storms accompanied by lightning may not exceed twenty or thirty in the course of a year. Some thirty years ago an attempt was made in America to assess the number of lightning discharges taking place throughout the world, and it was conservatively estimated to exceed one thousand flashes for every second throughout the year. Of these about two per cent were B flashes and the remainder A flashes. In addition there was an almost continuous pattern of corona discharges, in varying degrees of severity and in many forms. Some of these—such as the Aurora Borealis—are of incredible beauty, though confined to certain latitudes. They are, however, allied fundamentally to lightning.

Incidentally, when one refers to "cloud masses" it does not necessarily infer that the clouds are visible to the naked eye. In a clear sky there are vapour masses which only become visible when they condense as tiny droplets to the conventional cloud patterns, but they nevertheless exist as patterns capable of holding static charges. So-called summer lightning is a series of visible discharges from these invisible masses, which are only rarely discernible in this country although quite common in the tropics.

Effect on Aircraft. Having summarized the principles of static charges and discharges in the atmosphere, let us now see how these are liable to affect an aircraft in flight.

Dealing first with the hazards of lightning strikes, we see that the aircraft in flight behaves very much as a cloud mass of relatively low electrostatic capacity. A potential will inevitably build up on its framework as a result of friction with the surrounding gas molecules, dust, water vapour, etc., by gas jets from engine exhausts, ventilation exhausts, propeller blades and similar causes of turbulence and also by virtue of exchange of existing charges with those on the particles themselves.

There will, therefore, be a constant variation of static charge which will be modified by induced temporary potentials from passing cloud masses, both visible and invisible. The difference between the potential of the aircraft as a whole and that of adjacent cloud masses will vary from negligible values up through corona-producing values to a point at which equalizing lightning discharges will take place between a point on the aircraft and the adjacent masses. This will be an A lightning stroke, but will be limited to a very small current (i.e., of the order of milliamperes) by reason of the relatively small mass of the aircraft. Evidence of such strokes is difficult to find, since it occurs at only one point and the resulting mark is almost indistinguishable from other scratches and blemishes which are bound to exist on the fuselage.

These discharges are harmless, though they interfere with radio and intercommunication equipment. Special discharge wicks, or static wicks, at various points on the aircraft, by providing a number of fine points at which the potential gradient is high, tend to disperse any static charges which are appreciably above that of the surrounding atmosphere at the lowest "quiet" corona levels. Providing that the aircraft is not passing through areas of rapidly changing potential or between areas of greatly differing potential, these dischargers will work efficiently.

A much greater hazard occurs from interception in direct cloud-to-cloud or cloud-to-earth A and B flashes. Where cloud masses are not visible, an aircraft may inadvertently trigger off a flash between two masses at different potentials and itself form part of the path of the discharge. In the case of an A flash on an all-metal machine, the effect may be a little disconcerting to the occupants but the danger will be slight. There will, of course, be two points of discharge, and these will appear as distinctive surface burns—or, more rarely, tiny pinholes—but the damage will not be serious since the current rarely exceeds a few amperes.

Interception in a B Flash. This is far more serious. Here the current may run into many thousands of amperes (though it is more often a matter of hundreds) and, although the duration of the stroke is measured in microseconds, the concentration of such energy at a small area can be most destructive at the points of entry and exit. Elsewhere it is likely to do less damage since the current will be more widely dissipated. Damage will depend largely upon the areas of entry and exit. On the aircraft skin it may take the form of holes from 0.1 to 2in in diameter, which could be disastrous on the pressurized cabin. Frequently these vulnerable areas are protected by the wings, tail unit or engine nacelles, so that quite extensive damage can be sustained without hazard to the aircraft or its occupants. In the extreme case the aircraft could be completely destroyed, but the chances against such an occurrence are of the order of ten million to one, since really high current B flashes—say, in excess of 50,000 amperes—are rare indeed.

The greater hazard from B flashes occurs when the strike takes place on a control surface and is transmitted via hinges which are not effectively bonded. In such conditions a flash of 1,000 amperes could weld the hinge and render the control surface inoperative. Both British and American airworthiness regulations call for "primary" bonding to guard against the possibility of such mishap, but in many cases—even on airliners—this bonding has been omitted or is inadequate. Despite this, no known failure of a control surface through lightning is on record, though there are many authenticated cases of damage to control-surface hinges through this cause.

Bonds across the hinges should be in the form of flat flexible copper braids, of not less than 0.009 sq in section, terminating in efficient flat tags. They must only be long enough to permit full movement of the control surface. Two such bonds are the minimum requirement for each section, and one per hinge.

The chance of an occupant in an all-metal aircraft receiving an electric shock from a lightning discharge is extremely remote, since the surrounding fuselage acts as a very efficient screen.

Aircraft and "Static". Apart from the lightning hazard, there is the inconvenience caused by static interference with communication systems. It cannot be classed as a hazard except only indirectly in that it might conceivably render communication between ground and air unintelligible during an emergency.

Contrary to oft-expressed opinion, shocks from static potentials on isolated parts of the aircraft do not constitute even the slightest hazard and are perceptible only to those with the most sensitive skins. Unless there is proper bonding, however, a potential difference might be created between an isolated metal fitting or component and the adjacent structure which would "brush discharge" to the structure, when the static potential difference exceeded

UNINVITED ELECTRICITY . . .

some 500 volts, with a "mushy" sound in the radio or intercom system. A number of such unbonded areas could cause continuous interference as the potential of the main structure changed during passage through areas of different potential.

Friction between metal-to-metal surfaces—hinges, control rod joints, etc.—are also generators of static; this discharges, as soon as it is generated, without causing interference. The presence of a lubricating film between the surfaces on such joints, however, can cause static build-up which is a common cause of interference. Lubricated knuckle joints should, therefore, be bonded across.

Such bonds do not, of course, carry any measurable current and so the size of the flexible is dictated by mechanical strength considerations rather than by current density. A suitable cross-section is 0.0008 sq in, which is equivalent to 105 strands of 44 s.w.g. copper wire. The tags are preferably attached by modern crimping techniques and connected to the metal parts by screws. Corona discharge does not take place below 600 volts and so the resistance of the bond is not important. The American value of $\frac{1}{2}$ megohm is, perhaps, on the high side while the British figure of 0.05 ohm is unnecessarily low.

Discharge of Static on Landing. On approaching to land, the chances are that an aircraft will have a static charge at an appreciable potential from that of earth. Since the aircraft is normally insulated from earth by rubber tyres, anyone touching it may receive a severe shock, for from a human point of view its static capacity is very large. In fact, such a shock could in certain circumstances prove fatal.

An important preliminary to disembarking is to ensure that any static on the aircraft has been discharged and that the potential of the structure is at that of the earth. On many post-war aircraft conducting tyres incorporating a high percentage of carbon have been used, the resistance being sufficiently low to discharge the aircraft within a few moments of touchdown. Such tyres, however, have not been standing up to the shocks of landing at the higher speeds of later jet and turboprop aircraft and their use is being discontinued.

An alternative arrangement is one in which a short length of spiral spring curtain-rod is trailed from the nosewheel chassis in contact with the ground. This may prove effective on wet runways but is extremely doubtful on dry concrete or asphalt. A recommended method is one in which the static is discharged via a water jet attached to the main wheels and operated by the oleo legs as they take the weight of the aircraft on landing. This is most effective, the use of water having long been recognized as an efficient static discharger.

Summarizing all the aspects of static discharge and lightning protection on aircraft, it can be appreciated that the lightning hazard is one that is ever present when flying in areas in which electrical storms are prevalent; but provided that reasonable bonding precautions are taken, only a very small proportion of the direct strikes on an aircraft are likely to cause real damage such as to hazard its safety. In regard to static, bonding can eliminate all sources of interference; but in the past it has, perhaps, been over-applied as an insurance against ignorance of the factors applicable to the problem. Earthing arrangements for aircraft on landing are, however, still capable of considerable improvement.

SOCIAL ROTATION

A HELICOPTER rally in which about 17 different types of aircraft are due to take part is being planned for Sunday, May 10, in the grounds of Woburn Abbey, home of the Duke of Bedford. The organizers, the *Passenger Transport Journal*, have sent out invitations to, and had acceptances from, a wide variety of helicopter users and manufacturers. The former include the Army Air Corps, the U.S.A.F. and B.E.A., European Helicopters, Fison-Airwork, Bristow and Salvesen; and the manufacturers will be represented by Saunders-Roe, Bristol Aircraft and Westland. Types of helicopter on view will range from the Bensen Gyroglider, Alouette, Skeeter, Kolibrie and P.531 to a Bell 47, Sikorsky and Whirlwind. A commentary on the afternoon's flying will be given by S/L. Basil Arkell.

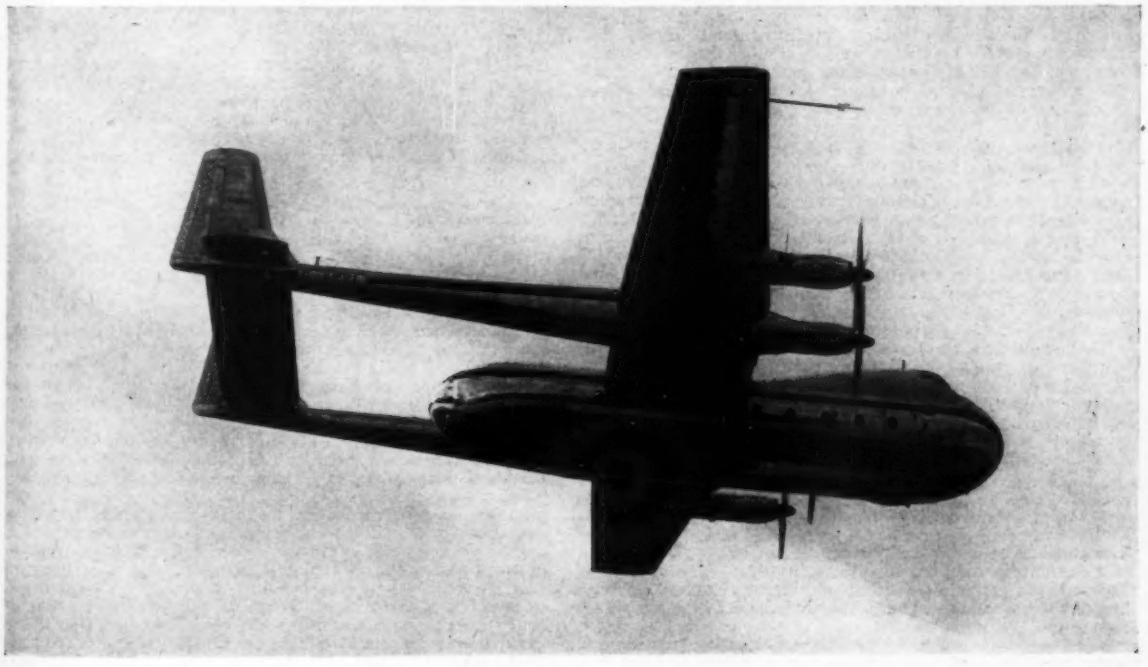
NEW GLIDE-PATH GUIDANCE

THE Federal Aviation Agency has awarded a contract worth $381,446 to Gilfillan Brothers Inc. for the development of an experimental range and elevation guidance for approach and landing (REGAL) system to be installed at the experimental centre at Atlantic City. The new system is intended to provide angle of approach information for instrument or autopilot use in a form which allows an aircraft to follow its optimum descent path in relation to a ground reference, and not necessarily a unique glide-path. REGAL will cover approach and touchdown; and an analogous localizer element will later be added.

The Gilfillan REGAL is reported to use a "radio scanning-beam technique that establishes a grid-in-space or 3-D type of information which is sent to a landing aircraft."

THE SECOND ARGOSY SHOWS HER PACES AT COTTESMORE

One of the best likenesses of the Armstrong Whitworth Argosy secured to date is this "Flight" ground-to-air portrait obtained at Cottesmore last week on the occasion of the Prime Minister's visit (see pages 482-483). Finish and trim were very favourably commented upon, and a "Flight" representative found the cockpit a sheer delight. It was the second Argosy's first public appearance



Aeronautical Bookshelf

"Factories and Plant," by William Hornby. (History of the Second World War, United Kingdom Civil Series.) Her Majesty's Stationery Office, York House, Kingsway, London W.C.2. Price 37s 6d.

THE shadow aircraft industry, which was supposed to be ready to produce great quantities of aircraft when the last war started, apparently lived up to its name too literally. This is revealed in this the last volume of the semi-official history of the Second World War in Britain. To the total British war-time aircraft output the shadow industry contributed only 12 per cent. But this can mislead, for had the Spitfire factory at Castle Bromwich remained in the shadow industry instead of being transferred to Vickers in 1941, that industry would have produced 22 per cent of our war-time aircraft.

Mr. Hornby makes it quite clear that the vast majority of our aircraft came from what he calls the professional industry, i.e., the established aircraft firms. In 1944, at the peak of the production programme, the professionals employed 250,000 while the shadow factories—Mr. Hornby does not call them amateurs!—had a payroll of 45,000. These figures exclude the hundreds of thousands of workers engaged in subcontracting and the manufacture of engines and other items of "bought out" equipment.

But the shadow industry does seem to have been given the most difficult part of the job, for their orders were to make primarily bombers. They produced 45 per cent of the total output of heavy bombers and two-thirds of the Blenheim light bombers. So in this light their contribution does not seem so poor. Even though it was the "heavies" which came from the shadows, 78 per cent of the total structure-weight came from the aircraft industry itself. In 1935 just under 900 aircraft were made in Britain; a year later the figure had risen to only 1,830 and everyone could see the need to get the shadow industry in working order. But before the war ended, the professionals had shown their ability—by 1944 their numerical output was 12 times that of 1936; and measured in structure-weight it was 40 times as great.

This tremendous increase was a result of the expansion of the old established aircraft companies, not by the arrival of any new professionals. Of the 24 aircraft companies in production in 1944, all but two had been in the business in 1936. These vast expansions by the professional industry did not begin to be approved by the Government—which was paying the bill—until May 1938. At this time three major extensions, each of them larger than any of the 1936 shadow factories, were agreed. Two of these became major sources of heavy bombers and the other a major supplier of Hurricanes.

In less than two years from the summer of 1938 ten new factories were approved by the Government in the aircraft industry as well as several major extensions to existing plant. But by 1941 the discrimination against expansion of the shadow factories seemed to end, and further buildings were agreed for both types. The firms making heavy bombers made the greatest extensions, which is not surprising when we remember that the aircraft they were building in 1936 were, in construction and weight, comparable with war-time trainers. They obviously needed the most room for the largest aeroplanes.

This major increase in production could not have been achieved simply by extending the aircraft factories alone. The now familiar operation of sub-contracting was started in earnest. In October 1939 the Air Ministry asked firms to sub-contract up to 50 per cent of their airframe work, and to avoid sending it to the areas which were already major aircraft centres and therefore vulnerable targets for enemy bombers. As production increased (the maximum output in any one year was 26,461 aircraft, in 1944) this figure was reached and, by some firms, exceeded.

The whole field of aircraft production is examined by Mr. Hornby. He ranges over all the problems and solutions affecting the engine and component manufacturers, as much as he does the airframe makers. He includes some details of the not-too-successful underground factories. His book covers the whole field of munitions, not just aviation, and is a clear and wonderfully detailed picture of British war production. A. C. B.

Fundamentals of Advanced Missiles, by Richard B. Dow. John Wiley & Sons Inc. (Chapman & Hall Ltd.), 37 Essex Street, London, W.C.2. Price 94s. Illustrated.

THIS book is something of a compendium of the fundamentals that collectively comprise missile engineering. The author has undertaken a gigantic task in attempting to compress so much into 550 pages and must not be harshly judged if he is not always successful.

The book is divided into nine chapters, covering kinematics of flight; application of fluid mechanics to aerodynamics and propulsion; dynamics; probability and statistics; microwaves; infra-red radiation; radar; guidance; and guided-missile systems. The author's stated intention is to present these subjects in a logical rather than formal manner, and thereby to show that a guided missile is a composite system with an overall performance having the characteristics of a closed-loop servo. It might, therefore, have been better had he put his chapter on guided-missile systems at the beginning instead of the end of the book, where it would serve as an introduction to the more detailed treatment to follow.

To achieve his condensation Dr. Dow has put the sections on propulsion and aerodynamics into the chapter on fluid mechanics, but reserves his remarks on aerodynamic forces for the chapter on dynamics. This is a commendable division and emphasizes the logic of the presentation. The description of the principles of propulsion is not very clear, and no very lucid physical picture of the processes involved is evoked. The importance of entropy as a thermodynamic parameter is not sufficiently stressed, and neither is its meaning clarified. On the other hand, the description of the calculation of adiabatic flame temperatures is a model of lucidity.

The chapter on dynamics leads from fundamental principles to the simplified equations of flight and automatic control systems. Gyroscopes are briefly treated but, to the uninitiated, the fundamental difference between rate and integrating gyros might not be apparent. A section on heat transfer in this chapter should, more logically, have been included in the fluid mechanics chapter.

This reviewer found the chapter on probability and statistics too long—it occupies almost one fifth of the book—and although this subject is now of great importance in studying noise in homing systems, a briefer and simpler treatment might be welcomed by the student. A brief chapter on infra-red radiation is most valuable since this subject is often dismissed in a few paragraphs.

A most serious omission in the guidance chapter is a proper treatment of inertial navigation. It is discussed only as part of an autopilot system, whereas most inertial systems are distinct from, although complementary to, the autopilot. Since almost all intermediate- and long-range missiles, not to mention satellite launching vehicles, are now guided by inertial systems, this must be regarded as a manifest weakness in a book of this nature.

The presentation and printing are of the high standard we have come to expect from American publishers, but the author's copious use of footnotes is very irritating, and most of them could have been incorporated into the text with advantage. There are several hundred of them in the book. Another weakness is the complete lack of references.

Nevertheless, *Fundamentals of Advanced Missiles* will be of great value to the young graduate starting a career in the guided-missile field. It is a very readable book and can be confidently recommended to project engineers who need to learn something of the subjects with which they are not familiar, whilst the specialist should welcome it as a handy reference book on subjects outside his speciality. H. M. B.

Rockets and Missiles, by Maurice Allward and John W. R. Taylor. Ian Allan Ltd., Hampton Court, Surrey. Price 2s 6d. Illustrated.

THIS is the latest of the A.B.C. series—concisely and intelligently written, and adequately illustrated, although a few less familiar photographs would have made it more appealing. Guided weapons now in use (or soon to come into service) in the U.K., France, Italy, Russia, Sweden, Switzerland and the U.S.A. are covered, and there is a most useful list of those under development in these and other countries. There is a little information about the U.S. anti-missile missile—the first of the "antis," as they have been dubbed.

Plane Crash, by Clayton and K. S. Knight. Elek Books Ltd., 14 Great James Street, London, W.C.1. Price 18s. Illustrated.

IN any book dealing with accident investigation or so-called mysteries of the air, the Comet is inevitably assured of its place, in the same way as no volume on crime detection is complete without Crippen.

"Seldom in the history of aeronautics," write the authors, "has an accident brought about such revolutionary soul-searching and reaching out for the hitherto unknown as did the Comet disasters." But it is a pity that in their searching they did not get their facts completely right, for there are one or two inaccuracies which tend to make the account on the Comet investigation a little less useful as a case history than it might otherwise have been. The book also draws a quite wrong analogy between the American C.A.B. and the British Air Safety Board, with the result that the British system of accident investigation is by no means correctly described.

In their readable accounts of major air disasters and the meticulous efforts to solve them, the authors introduce something of the drama of a good whodunit: the reader is able to follow the path of investigation, analyse the clues, and anticipate where they will lead. It is a tribute to the handling of the subject, which could so easily have been highly coloured and sensational, that the reader emerges with his faith in the efficiency of aviation and air transportation enhanced rather than shaken by the presentation of disaster. A. J. W.

BOAC TO TRANSOCEAN

TEN FAITHFUL STRATOCRUISERS BEGIN A NEW LEASE OF LIFE

By DENNIS M. POWELL

G-AKGK "Canopus" (top), delivered to Transocean on March 10, was one of B.O.A.C.'s best-known Stratocruisers, having often carried royal and other important passengers. Seen at Oakland International in its new owner's colours is ex-B.O.A.C. Stratocruiser G-ANUM, "Clyde"

BACK in March 1956 a brief report in a well-known American aviation journal stated that B.O.A.C. had commenced negotiations with the Babb Company (of New York) for the sale of its Boeing B-377 Stratocruiser fleet, and that these aircraft would probably be progressively withdrawn from Corporation service as from the end of 1957. At the time, not surprisingly perhaps, neither party would confirm or deny this "unofficial" report. But, to quote the old proverb, "There's no smoke without fire"—even in the long and sometimes exceedingly complicated business of disposing of transport aircraft.

Although on at least two occasions in 1957 the Minister of Transport and Civil Aviation was questioned in the Commons concerning the sale and/or disposal of B.O.A.C.'s Stratocruiser fleet, it was not until publication of the Corporation's annual report for 1957-58—officially released in July last year—and a Press conference held during the first week of August that final and absolute confirmation was given by B.O.A.C.'s chairman. He stated that fourteen out of the sixteen aircraft were to be returned to the manufacturers on a trade-in credit basis, to be set against the fifteen Boeing 707s on order by the Corporation. Concurrently it was also briefly disclosed in the report that "amortization rates for the B-377s have been adjusted, so that their residual value next year (i.e., 1959) would be that which Boeing will pay for them in the turn-in deal against the 707s on order."

According to official statements released by Boeing, the Babb Company were appointed exclusive agents for the sale of the 14 ex-B.O.A.C. 377s. Furthermore, it can now be disclosed that ten of these aircraft have actually been sold to Transocean Airlines Inc.

It is not without interest to indulge in some "guesstimation" on the trade-in value of the 14 Strats, and how much Boeing will be allowing B.O.A.C. in this big and most certainly complicated financial deal. According to an excellent and highly informative report by J. L. Wagner (*Shell Aviation News*, September 1958), the author states that "according to Wm. C. Wold Associates Inc. (the world's largest aircraft brokers) the market price for a B-377 was one million dollars in 1954, and is currently around $350,000, and by 1965 it will be as low as $100,000." Another source in the same report states that "you should not expect more than about $275,000 per B-377 *in any volume*" (my italics). Anyhow, *Flight* has already published details of the Northwest/Lockheed deal in which nine B-377s are involved, and the trade-in value per aircraft is $390,000 (p. 857, issue of December 5). Readers will thus be able to draw their own fair conclusions on the B.O.A.C./Boeing/Babb transaction.

At the time of writing four of the Boeings are already in service with Transocean, so a brief résumé on this progressively expanding U.S. independent is appropriate. The company was originally formed in March 1946 by an ex-United Airlines senior pilot (1931-43) and seven of his oldest friends. Orvis M. Nelson, the founder-president, is reputed to be one of the most dynamic personalities and intensely shrewd top men in the vast U.S. airline industry. And that, in itself, is indeed a significant fact.

It seems that Nelson's reputation for efficiency (apparent in the possibly unmatched safety record of his company's thousands of charter flights and scheduled services covering practically world-wide operations) goes back to 1946-47 when Nelson and his team ferried 150-odd Curtiss Commandos from the U.S. Pacific coast to China. Certain senior members of the industry offered to bet that one out of every dozen C-46s would have to be ditched in the Pacific. In the event, however, not a single one was lost in this big job of ferrying, which in total involved no less than 1½ million miles of over-ocean flying. The pessimists were now convinced that Nelson and his top executives really knew how to pick their crews and ground engineers, and the episode gave Transocean an early reputation for reliability and safety.

The mass emigration of 7,000-odd immigrants from the U.K. to Ontario Province, Canada, was another highly successful operation executed by Transocean, this time under contract to T.C.A. and the Canadian Government. The special immigrants fare was only £67, and this low figure was achieved without subsidy. In just under 12 weeks (from August 2, 1947) with only four DC-4s, each seating 38 passengers with 65 lb of baggage apiece, "Operation Ontario" was accomplished without any major hitch. Average turn-round of the DC-4s was 19-20 hr, and this included a complete 30 hr check, thus assuring a high continuity of safe operations in this formidable job. The company, incidentally, was lavish in its praise of the co-operation it received from B.E.A. at Northolt during the whole of the operation.

Transocean originally began operations with only two C-54s, modifying them in their own engineering base at Oakland Airport, California. When modest profits eventually started to come in the company bought several more C-54s (and some C-46s too), handling its own overhaul, maintenance, and modifications at the lowest possible costs. By buying these aircraft at modest prices from the U.S. War Assets Board and later selling them at fair profits, Transocean always kept their overheads within strictly economic bounds. Correspondingly, when business boomed (e.g., in the Korean conflict) the airline operated as many as a dozen C-54s and six C-46s at one time. Likewise, several C-54s were leased or sold when it became necessary to do so. High load-factors, maximum utilization, complete elimination of frills; these things, plus Transocean's own system of securing return loads, have always enabled the company to keep its charter rates remarkably low.

The pilot's log-books of six of the eight directors, including the founder-president, currently show an aggregate of over 140,000 flying hours. Thus Transocean is very much a "pilot's airline."

And now for the Stratocruisers themselves. Those already mentioned as being in service are:—

CN.15974,	G-AKGH	*Caledonia*	now flying as	N137A
CN.15978,	G-AKGL	*Cabot*	" " "	N86Q
CN.15927,	G-ANUM	*Clyde*	" " "	N1027V
CN.15946,	G-ALSD	*Cassiopeia*	" " "	N85Q

G-AKGH is affectionately remembered by thousands as the original flagship of B.O.A.C.'s 377 fleet: ferried by Capt. Alan Andrew from Seattle to London Airport on November 15-17, 1949, she was officially named *Caledonia* at a colourful ceremony held at Prestwick (in June 1950) by Lord Pakenham, then Minister of Civil Aviation.

In August of last year *Caledonia* left London Airport for New

BOAC TO TRANSOCEAN . . .

York on her last flight in B.O.A.C.'s livery. She was ferried to Oakland, and in the same month G-ANUM was also ferried by her B.O.A.C. crew to the same destination. It is interesting to recall that G-ANUM had been sold to B.O.A.C. in the winter of 1954 by Pan-American. They had been operating her on the Atlantic schedules since 1949, her former identity being N1027V and name *Clipper Friendship*. As stated in my article "The Stratocruisers Carry On" (*Flight*, June 14, 1957), she was one of the seven additional B-377s acquired by B.O.A.C. in 1954, the other six being ex-United Airlines. Most of her four years' service with B.O.A.C. was spent in operating the all-tourist "Coronet" North Atlantic schedules, in which her seating configuration was normally 81 passengers.

The other two B-377s were both ferried by B.O.A.C. crews to Transocean's Atlantic Coast Engineering Base at Bradley Field, Windsor Locks, Connecticut, both aircraft leaving London Airport in September 1958.

Total current airframe hours on each Stratocruiser are: G-AKGH, 19,382; G-AKGL, 18,534; G-ALSD, 19,226; G-ANUM, 20,119. Not surprisingly, perhaps, the sole ex-P.A.A. Boeing has a slight edge on the other three in the number of hours flown. Average per annum is therefore 2,100 hours per aircraft in nine years of continuous service.

Following their conversion at Transocean's workshops at Oakland and Bradley airports respectively, all four are currently equipped with 60 high-density seats in the forward main cabin, plus 26 standard-type seats (fully reclining) in the rear cabin; and, of course, there are the additional 12 seats in the lounge (lower deck). All four can quickly be converted to the maximum coach-class configuration, seating 112 passengers; this latter layout incorporates three toilets, plus a "quick-service buffet" which is situated in the forward crew compartment. Transocean's colourful and distinctive livery is clearly shown in the photograph of N1027V. With the characteristic white top, all lettering is in black with the cheatline around the fuselage in "antique gold" and finally, the TAL emblems are in black and "aqua" on both the rudder and the nose.

The four Stratocruisers are now flying on Transocean's twice-weekly Oakland - Honolulu - Wake Island - Guam - Okinawa schedules, and in addition, they also operate on the airline's scheduled domestic transcontinental flights (at the moment twice-weekly and presumably restricted to such) between Los Angeles and/or San Francisco to Chicago and New York (usually terminating at Hartford, Conn.). On both the domestic and trans-Pacific schedules, the B-377s alternate with at least three Constellation 749As (which, interestingly enough, were also acquired from B.O.A.C. less than 18 months ago).

In the words of Transocean's vice-president (operations), "We are happy to tell you that our flight crews, maintenance personnel, and our passengers too, are delighted with these grand old airplanes, and it is my opinion that they will see many years more of airline service before reaching retirement age."

Footnote: Since the above was written (in East Africa), Transocean have told me that they are currently converting two more ex-B.O.A.C. Stratocruisers, G-AKGI *Caribou* and G-ALSC *Centaurus*. B.O.A.C. also, have kindly provided delivery-flight data on all ten aircraft: details are given below. I particularly wish to thank Mr. T. E. Scott-Chard of B.O.A.C. and Mr. W. L. Keating, Transocean's vice-president (operations) for generous assistance in compiling this article.

Aircraft	Dep. L.A.P.	Captain	New cabin layout	Airframe hours on delivery
G-ANUM	5.7.58	L. B. Reynolds	40 de luxe	19,247
G-AKGH	2.8.58	A. J. Smith	ditto	18,672
G-ALSD	7.9.58	N. V. Todd	60 first-class	18,669
G-AKGL	13.9.58	J. H. Wickson	81 tourist	18,535
G-ALSC	18.12.58	C. Middleton-Stewart	40 de luxe	19,242
G-AKGI	19.12.58	M. A. Wood	ditto	19,091
G-AKGJ	17.1.59	S. G. Brook	ditto	18,935
G-ALSB	3.2.59	C. R. W. Taylor	ditto	19,303
G-AKGK	3.3.59	M. A. Kyle	81 tourist	19,740
G-AKGM	10.3.59	B. G. Carr	ditto	20,305

COMMEMORATING HARRY BUTLER

AT Minlaton in South Australia a memorial building was recently opened housing the Bristol Monoplane *Red Devil* in which the late Capt. Harry Butler made the first air-mail delivery (in 1919) from Adelaide to Minlaton. The memorial commemorates not only this pioneer flight but Harry Butler himself, who spent his boyhood a few miles from Minlaton and whose story epitomizes the determination of a born pilot to fly no matter what the obstacles.

These seemed insuperable on the small farm where Butler spent his boyhood; but he got his first contact with aircraft in his early twenties by riding 120 miles nearly every Saturday on his motor cycle to Smithfield, where a Mr. C. W. Wittber was building an aeroplane of which he had constructed every part himself. Helping to build and making short flights in this machine whetted Butler's appetite for flying, and when war came he went to Point Cook early in 1915 to enlist in the Australian Air Force. Delays fretted him, however; so he went off to England at his own expense to join the R.F.C., enlisting in 1916 as an air mechanic but being gazetted 2/Lt. after three weeks and by July that year flying in France. His greatest talent proved to be as an instructor, and in this capacity he adopted a typically individual routine. He would fly over to France, attach himself to a fighter squadron for some weeks to study new German tactics at first hand, then go back to his school to teach countermeasures he had worked out. In early 1918 he was wounded in the head over Douai, and in December that year awarded the A.F.C. He also made much use of the then usual technique of dropping weighted messages from aircraft; and this practice had a sentimental repetition when, after returning to Australia and making his first mail-carrying flight, he dropped a message of greetings on his old school near Minlaton.

Harry Butler went on flying in the small company he helped to form (with "aerial passenger carrying and advertising services" among its objects), giving displays and participating in Australia's first Aerial Derby (1920); but the company was voluntarily liquidated in 1921 and the following year he was involved in a disastrous accident in an Avro biplane. He survived only by a miracle, so serious were the injuries to his face and head; but such was his courage that he even flew again on one occasion, and in October 1922 he donned his R.F.C. uniform to lay the foundation-stone of a war memorial. But in 1923 he died at Minlaton as a result of his injuries; and now his restored *Red Devil*—in beautiful condition but with a D.H. Gipsy engine, though its original 110 h.p. Le Rhône and propeller are also on show—is permanently displayed at the town as a memorial to this great-hearted and gallant Australian airman.

How to care for an historic aircraft: Harry Butler's Bristol Monoplane on permanent display at Minlaton, South Australia

RETROSPECT

From "Flight" of April 10, 1909

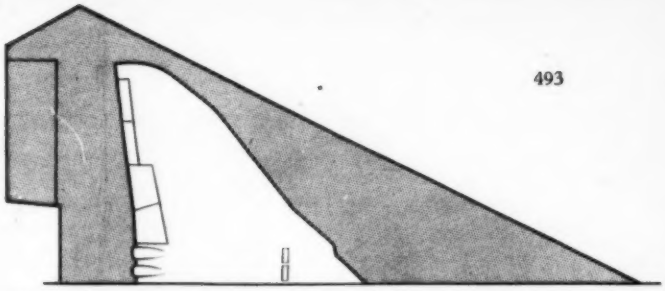
A Lecture at Lincoln: That there is a good deal of interest taken in flight in provincial centres was shown at a lecture given in the Central Hall, Lincoln, on March 30th, by Mr. C. E. Wright, M.A. The chair was taken by the Mayor, and although the audience was not very large, it made up for this in enthusiasm. In a not-too-technical manner, the lecturer reviewed the early history of man's attempt to master the air, and the performances of the Wrights and other foremost flyers of the present day were dealt with. Perhaps the most interesting part of the programme was a series of elementary experiments to illustrate various points. Mounting a high pair of steps, the lecturer launched his first model airship—a light plane that sailed gaily half the length of the hall amid warm appreciation. Similarly he floated from his summit a series of strips of paper, variously weighted, demonstrating very easily the balancing and counterbalancing effects of each. Miniature ships of mica and celluloid were sent flying across the hall to show the difference in effect between vessels of straight and curved fins.

One of them that soared a full fifty feet had a particularly graceful motion, and though it narrowly missed the head of an important corporation official it was given a generous meed of applause. Other gliders helped the lecturer to show a path of an undulating kind as pre-ordained for some of these vessels, and a further one, an aeroplane that actually had the talent of looping the loop. The features of the Wright aeroplane were explained by diagrams, and a model of the aeroplane flown by Farman and Delagrange was sent off from the step ladder with great success.

Some of the audience were so interested that they stayed behind after the lecture, and asked Mr. Wright to conduct more experiments and explain them.

Valkyrie Wing

THE WORLD'S BIGGEST AND HOTTEST DELTA



This sketch gives an indication of the size and shape of the stainless-steel-honeycomb wing of the B-70 Valkyrie. Superimposed upon it is a half-wing of the Vulcan B.2 to approximately the same scale

IN a recent advertisement the Los Angeles Division of North American Aviation Inc. said of their B-70 Valkyrie intercontinental bomber, "The B-70 will skirt the edge of space to any target on earth—flying every mile of the way at more than 2,000 m.p.h. It will carry the most advanced weapons, including missiles it can launch hundreds of miles from ground defenses or primary targets, plus countermeasures against enemy attack." The problems of designing a reliable vehicle to accomplish this task are greater than any previously faced by an aircraft constructor. Even the immense engineering and scientific strength of North American Aviation is insufficient to meet so colossal a challenge; and, following a practice long established in the aeronautical field, much of the work has been farmed out to sub-contractors. So great is the task, in fact, that many of these sub-contractors are themselves the giants of the American aircraft industry. The largest company of all—Boeing—has been assigned the task of designing and manufacturing the complete mainplane.

An accompanying sketch gives a rough indication of the size and shape of this remarkable wing. Since the gross weight of the aircraft will be of the order of half a million pounds, the wing will have to be very large indeed to permit operation from existing Strategic Air Command runways and to confer the announced operating height of "above 70,000ft" with full operational load. The Valkyrie will be a canard, control in the pitching plane being achieved by a delta foreplane, the wing being provided with elevons and carrying the six General Electric J93 turbojets in under-slung triple packages.

Originally the Weapon System 110A (as the overall project was then termed) was to be a subsonic-cruise bomber with a dash performance of about Mach 2. During 1956-57, however, the requirement was changed to the far more challenging one of an all-supersonic machine, as noted in the North American statement. The wings may therefore be expected to reach skin temperatures of well over 500 deg F, and to soak at these temperatures for more than three hours. The form of construction chosen has been outlined in an article by Don Brannon of the Boeing Airplane Co. in the current issue of his firm's house magazine. The following is a slightly abridged form of his article.

"The Air Force's future Valkyrie bombers will arrow through the sky on the largest delta wings ever built—wings designed and manufactured by Boeing's Seattle Division. These wings will have greater resistance to heat and sonic vibration than the wings of present large aircraft. Fuel-carrying wing bays will be insulated from surface air-friction heat.

"The Valkyrie will be America's first bomber using stainless-steel honeycomb-sandwich panels for outer wing covering. Panels will be constructed primarily of PH 15-7 Mo stainless steel. The panels will range from about the size of a large flapjack to 8 by 20 feet, and will be an inch thick. To do their job, panel cores and outer sheets must be brazed together—a tricky process with stainless steel.

"Two existing Boeing hangars are being connected to form a building of 77,000 sq ft where the wing panels will be made. This construction and new equipment will cost more than $3m. Additional equipment amounting to almost $2m will be installed in existing factory areas to support the wing-building job. Assembly and joining operations will be accomplished in the high-bay area of the main factory assembly building at Boeing plant II.

"From start to finish, stainless-steel-honeycomb brazing requires utmost care. Although the finished panel is tough and strong, by itself the honeycomb core is little stronger than the bee-built variety. Even finger pressure can damage the paper-thin core. Machining to the required 0.002in tolerance will be accomplished with the finest grinding and cutting tools. Core and outer sheets will be prefitted to assure perfect alignment, then disassembled for final cleaning. So critical is the brazing process that panel components will be handled only with clean white gloves by men working in special, dust-free rooms.

"Thin brazing-alloy sheets will be placed between core and outer skin, and will be composed principally of silver, but will contain 7.3 per cent copper and 0.2 per cent lithium. After careful tack-brazing to hold core, alloy and outer sheets together, the sandwich will be prepared for insertion in a specially designed retort. A metal framework will be constructed to confine the flow of molten alloys to desired areas.

"Extreme care will have to be taken with construction of the retorts. They will be built of stainless steel 0.04in thick. Each retort will be used only about four times before being replaced. Within the retort, a tack-brazed panel will be laid on a finely tooled graphite base shaped to support it. Graphite combines the advantages of physical stability and good thermal conductivity. When all material is properly aligned inside, the retort will be welded air-tight with the exception of an important pair of pipes.

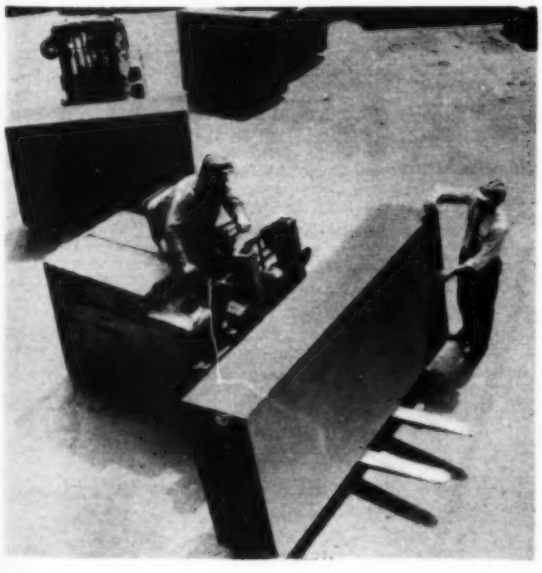
"These pipes will extend from inside the retort through a second air-tight outer shell called a muffle. When a panel is ready for firing, both inner retort and muffle will be purged and their air replaced with argon gas. Argon, being inert, will not combine with or form impurities in honeycomb-panel components during the high temperatures necessary for brazing.

"The four-stage processing cycle will begin with the placing of a furnace hood over the retort setup. The firing cycle will last for several hours, during which the panel will be heated to 1,750 deg F. A controlled cooling to room temperature will take place within a specially designed cooling head. The panel next will receive a deep-freeze treatment, spending several hours in a refrigerator room at 100 deg below zero. Then temperatures will be raised again to near 1,000 deg in a draw furnace, and the panel will be allowed to cool once more to room temperature.

"To make sure that panels are perfect, each will be inspected by one or more of three methods—X-ray, fluoroscopic, ultrasonic. This will complete the manufacturing process, which will ensure fullest possible strength and reliability.

"By July Boeing's new facility is expected to be ready for research and development work. Production will begin early next year. New equipment will include contour-machining equipment to shape the graphite base blocks, and a low-temperature curing oven for joining these base blocks. Other major equipment to be installed will include a skin mill for honeycomb-core machining, inspection instruments, 10 cleaning and pickling tanks and overhead handling facilities. Some 30 pieces of existing equipment will be relocated to the new factory in addition to new facilities being procured.

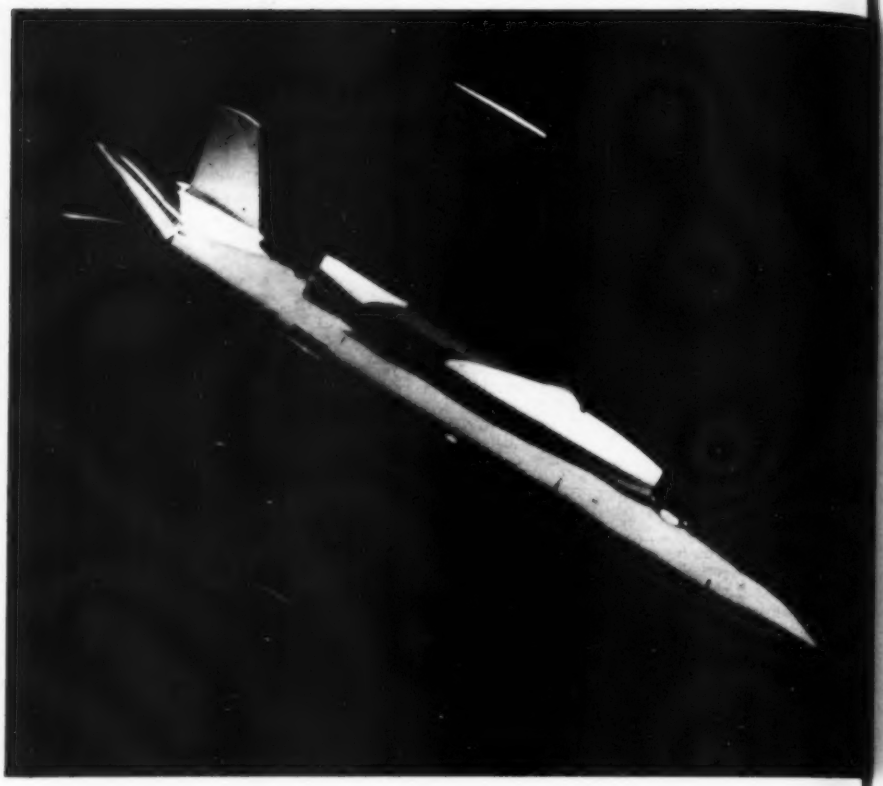
"Boeing engineers are studying the wing-brazing method with the hope of speeding production and reducing costs. Considerable refinement of the method described above may be made, possibly even before the factory goes into operation."



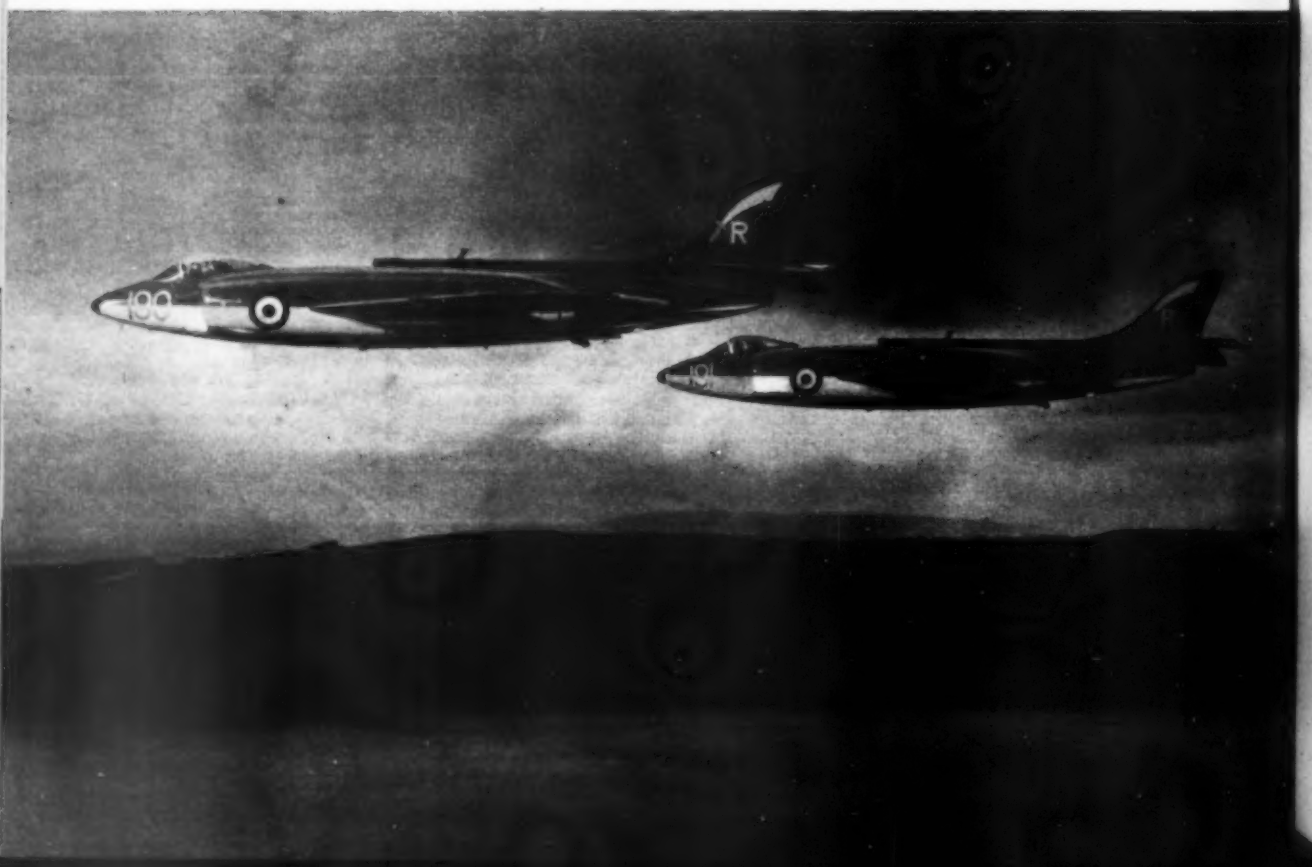
In order to hold the honeycomb panels during the brazing operation very large blocks of graphite will be required. In the foreground of this photograph is a form block 20×46.5×110in, the largest in the world

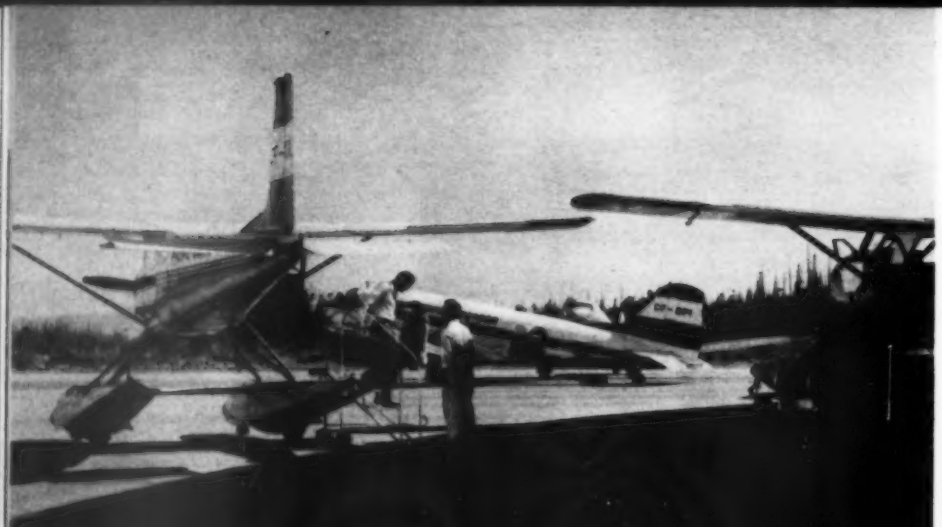
Since the above was written, a news release from the Union Carbide International Company of New York has commented upon the size of the graphite blocks which are required to braze such immense panels. After reiterating the fact that graphite has a very low coefficient of thermal expansion and can be precisely machined to the intricate contours required, Union Carbide state that production techniques have now been developed to increase the size of graphite reference form stock from 20×46.5×62in (shown in the background of the photograph) to a length of 84in and, most recently, to a record-breaking 110in (foreground). A number of such forms joined together will permit the fabrication of honeycomb panels as large as 10×20ft. The Valkyrie will require some 19,000 sq ft of honeycomb sections, many of them far larger than any previously attempted.

In future the air-to-surface striking power of the Royal Navy will be vested in the Blackburn and General Aircraft NA.39 (right), Supermarine Scimitar (below), and D.H. Sea Vixen (opposite). All have twin turbojets: the NA.39, D.H. Gyron Juniors; Scimitar and Sea Vixen, Rolls-Royce Avons. The Sea Vixen is seen with Firestreaks, betokening its primary role of intercepter.



STORM-BIRDS





Pacific Western

AN EXPANDING CANADIAN AIRLINE AND ITS VANCOUVER ISLAND OPERATIONS

President and chairman of the board, Karl J. Springer

The late president and managing director, Russell Baker

PLACE-NAMES such as Tofino, Muchalat, Nootka, Tahsis, Ceepeecee and Zeballos have an unfamiliar and intriguing sound to English ears. They are in fact all located on the 280-mile length and 70-mile breadth of Vancouver Island, off the coast of British Columbia, and they are all included on just one of the regular services operated by the floatplanes and amphibians of Pacific Western Airlines. To visit some of these places and to see something of the flying services there was an impressive experience, yet this proved to be only a small part of an extremely widespread operation.

Pacific Western have come a long way since a bush pilot named Russ Baker started flying forestry patrols with one aircraft and one colleague in 1946. With a current fleet of 65 machines, varying in size from Cessna 180s to DC-4s, the airline has built up an active route network of services throughout British Columbia, Alberta, Saskatchewan, the Yukon and North West Territories. It is the third largest airline in Canada, and recently applied to take over from T.C.A. scheduled services between Vancouver, Victoria and Seattle—one of the highest-density air routes in North America.

The main steps forward during Pacific Western's history of expansion have been the acquisition of a number of other operating companies over the years, notably Queen Charlotte Airlines, Associated Airways and Whitehorse Flying Services. This method of expansion has resulted in a widely mixed aircraft fleet: last summer P.W.A. owned or operated no fewer than 79 machines of 17 different types, including such rare birds as Barkley-Grow T8P-1s and Junkers W.34s. The complete list was six Ansons, one York, two Barkley-Grow T8P-1s, 21 Beavers, one Beech 18A, two Bellancas, two Cansos, seven Cessna 180s, one Cessna 182, two C-46s, five DC-3s, two DC-4s, two Grumman Mallards, three W.34s, 11 Norseman, two Otters and nine Bell 47 helicopters.

At several points on the P.W.A. network, services operated by small floatplanes connect with the main scheduled DC-3 and Mallard flights. Above, from the left, are a Cessna 180, DC-3 and Beaver

Heaviest aircraft in the varied P.W.A. fleet are these two DC-4s, one of which carries the appropriate registration CF-PWA. Both are operated by the company's northern division, which is based at Edmonton

During the last twelve months efforts to reduce the number of individual types have continued, and P.W.A. now lists 65 aircraft of eight types as its current fleet. This is made up of six DC-3s, two C-46s, two DC-4s, 12 Norsemen, 23 Beavers (probably the largest Beaver fleet operated by any airline), two Mallards, eight Cessna 180s and ten Bell 47s.

Vancouver is the location of the company's head office and of its western division. The other operating unit is the northern division based at Edmonton, which includes among its services the operation of the re-supply and maintenance contract for the western sector of the DEWline radar chain. "Vertical" flights from Edmonton to arctic DEWline bases are made by DC-4 and C-46 aircraft, and smaller aircraft are used on the east-west "laterals" between sites on the radar chain.

Other services operated by the northern division include the Class 1 scheduled prairie run between Edmonton and Moose Jaw, Saskatchewan; Class 2 regular services from Edmonton to Jasper and Banff and to Yellowknife; Class 3 irregular services from Yellowknife; and miscellaneous charter work from a number of bases. The western division at Vancouver handles similar types of operation in British Columbia and the Yukon.

Following the Wheatcroft Report on competition over the Canadian transcontinental routes, Pacific Western filed an application last year for a scheduled service between Vancouver, Edmonton, Regina, Winnipeg and Toronto. This application was withdrawn, however, and the decision was made by P.W.A. to concentrate on expansion in the north-south feeder-line routes.

During the visit of H.R.H. Princess Margaret to Canada last year, Pacific Western and its Mallard amphibians were chosen to fly the princess during her stay in British Columbia. Hence the initial "M" surmounted by a crown which I noticed on the fuselage of Mallard CF-HPU when I joined Capt. J. Dunbar and boarded the aircraft at Vancouver Airport. This was one of the daily Vancouver Island flights to Tofino and Tahsis, where the Mallard connects with Norseman flights to 13 other towns and logging camps on the west side of the island.

On the day of our flight, persistent sea fog at Tofino forced us to make a direct Vancouver - Tahsis journey, but the fog was not

Vancouver Island operations: below right, the approach to Tahsis, a typical lumber town. The smoke is rising from the stack of the lumber mill. Below left, a Norseman arrives at the old gold-mining town of Zeballos. Above right, the daily Mallard from Vancouver comes ashore at Tahsis, and (left) the pilot, Capt. J. Dunbar, has a word with the local agent, Peter Furmento "Flight" photographs

A relatively rare bird these days is this Barkley-Grow T8P-1, one of two operated by Pacific Western. This type was built in the late 1930s by Barkley-Grow Aircraft Corporation, of Detroit, Michigan

sufficient to obscure the magnificent and dignified scenery of the island in general, made up of a pattern of fir-covered mountains hiding countless lakes and winding inlets. Tahsis is one hundred per cent a lumber town, and the smoke rising from the lumber mill marked its position as we approached at a few hundred feet along Tahsis Inlet, alighted on the water, and taxied up the ramp on to dry land.

We were met on arrival by Peter Furmento, the resident P.W.A. agent, whose other activities included operating the local restaurant and bowling alley (he was particularly pleased to greet his new Chinese chef who had arrived with us in the Mallard to take up his duties). At the time he was meeting us, his 14-year-old daughter Tana was manning (so to speak) the ground-radio station at the P.W.A. desk.

At Tahsis we transferred to Norseman CF-GUE piloted by Daryl Brown, and were able to see something of the connecting network to the smaller points served by P.W.A. A similar west-coast network is covered from Port Alberni. One of our most interesting stops was at Zeballos, an old gold-mining centre some 20 miles away, which now seemed quite dead and silent. After flying along the inlets back to Tahsis, where we were surprised to hear a Nottingham accent—belonging to Fred Gee, ground engineer—we returned later the same day to Vancouver by Mallard.

Pacific Western is planning a steady expansion for the future, aimed particularly at increasing its north-south feeder services from its twin main bases at Vancouver and Edmonton. Only one thing has marred its recent development—the death last year of its young and vigorous founder-president, Russell Baker, who worked hard to achieve P.W.A.'s present status. KENNETH OWEN.

The annual general meeting of the Royal Aero Club, held on March 25, was followed by the presentation of club awards. These included the club's Silver Medal to Mrs. Ann Welch (left) and a portrait to Col. R. L. Preston (far left), who relinquishes his post of secretary-general of the club on April 30. Lord Brabazon, who made these presentations, himself received the club's Gold Medal

Sport and Business

THIS year's National Air Races, to be held at Coventry Airport on July 9, 10 and 11, will comprise three championship-class contests and the King's Cup Race. The three class races will be for the Kemsley Trophy, the Osram Cup and the de Havilland Trophy, and each will be flown in three separate rounds, each of three or four 11-mile laps. In addition to these trophies, the Air League Challenge Cup, Norton Griffiths Challenge Trophy and Grosvenor Challenge Cup will be awarded for the highest average speed in the three races.

The first seven British pilots and aircraft in each of the championship class races will be eligible for the King's Cup Race, which consists of four laps of an 18-mile course; the pilot making the best speed over this course will be awarded the S.B.A.C. Cup. The other main event at Baginton will be the competition for the British Lockheed International Aerobatic Trophy. The closing date for entries (forms obtainable from the Royal Aero Club) is June 8.

A BREAKFAST PATROL at Biggin Hill on Sunday, April 12, will be the first flying function to be organized by Surrey and Kent Flying Club since their move from Croydon. Arrival time at Biggin should be between 9 a.m. and 9.30, and the defenders will be patrolling between one and three miles from the airfield, from 500 to 1,000ft above aerodrome height (585ft).

PAUL TISSANDIER DIPLOMAS were awarded recently by the Federation Aeronautique Internationale to the following four men for their various contributions to sporting flying in this country. Cdr. Alan Goodfellow, legal advisor to the Royal Aero Club and a trustee of the Kemsley Flying Trust, for his service to British and international aviation; Maurice O. Imray, aviation secretary of the Royal Aero Club, a founder-member of the Ultra-light Aircraft Association and secretary of the Popular Flying Association from 1951 until last year, for his work for the ultra-light aircraft movement; Basil A. G. Meads, secretary to the Kemsley Flying Trust and chairman of the Derbyshire and Lancashire Gliding Club, for his work for private aviation; and Andrew J. Thorburn, who has been actively associated with gliding in Scotland for over 23 years.

A NEWCOMER to the range of U.S. light twins, the Mooney Mark 22, is progressing steadily through its development programme and should be available for sale next year. The prototype has flown, and static and development tests should be completed in the early part of 1960, by which time a second prototype will be flying. The prototype Mark 22 airframe is basically that of a Mark 20A with a new nose and large dorsal fin, and this machine is powered by two 150 h.p. Lycomings. Subsequent aircraft will have 180 h.p. Lycomings and are expected to cruise at over 210 m.p.h. at a gross weight of 3,250 lb.

AN EXHIBITION OF PHOTOGRAPHS of aeroplanes and sailplanes taken by Charles E. Brown will be held at the Kronfeld Club from April 10 to 17 (excluding April 11 and 12). Admission will cost 1s; the exhibition will be open from 6 to 10 p.m. daily.

AN AIR DAY is to be held at Merryfield aerodrome, between Yeovil and Taunton, on Saturday, June 13. Donations to charity, and in particular the Round Table charity of polio research, will be made from the proceeds of ticket and programme sales. Participating aircraft will include vintage machines from the Shuttleworth collection.

THE USE OF LIGHT AIRCRAFT for topdressing operations in New Zealand, it is estimated, may be cut by some 50 per cent within the next twelve months. The reason given is the heavy incidence of taxation in the Dominion, which is causing the primary producers to cut the expense of aerial fertilizing of hill-country pastureland.

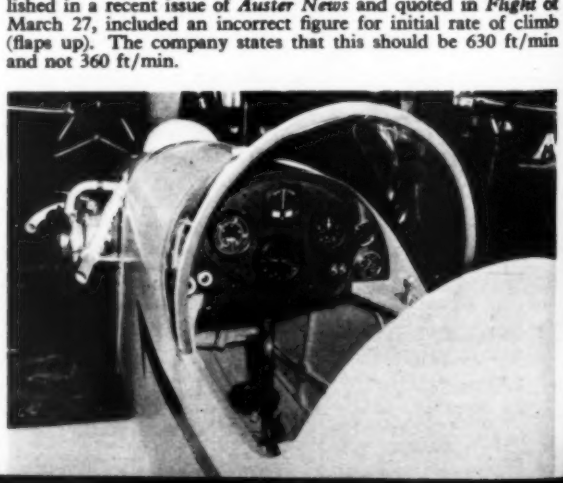
AMONG THE SAILPLANES to be flown by R.A.F. pilots in this year's national gliding championships at Lasham (*Flight*, March 27) are the Olympia 419X and Olympia 401 produced by Elliotts of Newbury. The "X" designation refers to the short-nosed version of the 419, and the 401 is basically the same model as the first Series 4 Olympia, which was flown by Geoffrey Stephenson in the world championships of 1954 at Camphill. The particular machine to be entered this year was made up from a set of 415 wings, for which a new Olympia 2 type of fuselage (modified appropriately around the wing roots) was built. This aircraft is owned by Elliotts and is being loaned to the R.A.F.G.S.A. for the championships: the decision whether to put the type into production will depend on the market demand.

A NEW VERSION of the 15-metre Skylark 2 sailplane, known as the Skylark 2B, has been introduced by Slingsby Sailplanes Ltd. The new machine incorporates a revised canopy with improved visibility, adjustable seat-back and rudder pedals, redesigned wing-spars and improved control systems.

FIRST LOCKHEED JETSTAR PROTOTYPE to be fitted with four Pratt and Whitney JT-12 turbojets in place of two Bristol Orpheus should fly in December this year. Delivery of the first four-engined executive Jetstar, to Continental Can Co., is scheduled for January 1961.

PERFORMANCE DATA for the Auster Workmaster, as published in a recent issue of *Auster News* and quoted in *Flight* of March 27, included an incorrect figure for initial rate of climb (flaps up). The company states that this should be 630 ft/min and not 360 ft/min.

Navigational aid for light-aircraft pilots: a ground identification sign being painted at Wrotham Hill, Kent, as part of an Automobile Association plan to provide national coverage in this manner



The cockpit of the Rollason Turbulent built for A. Cdre. G. J. C. Paul, secretary-general of the Air League, features a floor-mounted compass, and an artificial horizon among the panel instruments

Straight and Level

THE story of the Comet—what a subject for television! All the ingredients of mass-audience attraction: British scientific achievement, tragedy and disaster, brilliant technical detective story, resolute determination to win in the face of great odds, eventual victory, etc., etc.

Perhaps I expected too much of I.T.V.'s programme last week "The Tale of the Comet." But I am bound to say that the programme was not very well done. The interviews with Sir Geoffrey de Havilland, Sir Aubrey Burke and Mr. C. T. Wilkins were the best part of a programme that was ruined by a frenetic, strident, over-dramatized commentary, a young female interviewer with an American accent, and arty sets which (for example) required Mr. Wilkins to perch on a sort of airborne stool.

And the explanation of metal fatigue that Lord Brabazon was apparently required to give was an affront to the intelligence of the most non-aeronautical viewer.

It would be a pity if, when the time comes to televise the Comet story properly, D.H. politely declined to co-operate. I wouldn't blame them.

So long as the average TV producer scripts aviation in "super British wonder-plane" language and presents it in terms which will not make Mrs. Jones of Chorley Wood switch off, we shall have poor aviation television.

● Most of us know what an Old Boy is: a member of an institution, peculiarly British in character, founded to perpetuate the memories and camaraderie of schooldays.

The de Havilland Aeronautical Technical School has an Old Boys Association; and its North American branch has apparently run into a problem of title. I quote from the current issue of its journal, *Chinook*:—

"On the North American continent Old Boys are not what they are over 'ome . . . it is very often disconcerting to have to approach complete strangers on behalf of 'de Havilland Old Boys.' The average hotel banquet manager immediately suspects that one is making a reservation for the equivalent of the Chelsea Pensioners. . . ."

Is a change of name thinkable? This would seem to be good material for a "tradition or progress" tug-o'-war.

From the same issue of *Chinook*, incidentally, comes the following definition of public relations: Noise with Poise.

● Jan Smuts airport, Johannesburg, in common with other South African airports, seaports and railway stations, is amending its definition of *apartheid*. The words "European" and "non-European," are to be replaced by the words "Whites" and "non-Whites" over the appropriate doors and entrances. It seems that foreigners, and particularly Americans (who dislike being called Europeans) have been confusing their entrances and their exits.

Even Whites and Non-Whites is ambiguous. To avoid confusion why not have skin-pigment meters, and doors marked Pink, Chocolate, Yellow, Black, etc.?

It is a soothing fact that, in this space age, the No. 1 interest of children and TV audiences is not moon-rockets and spacecraft, but westerns. The kids buy more cowboy outfits than they do space suits, and eight out of ten of America's top TV shows are westerns—*Gunsmoke*, *Wagon Train*, *Wyatt Earp*, etc. Here, to typify the trend, is a picture from the Civic Center of Denver, where a Titan is being hoisted into exhibition position

● Guaranteed genuine letter addressed to me from a 15-year-old enthusiast abroad:—

"Dear Sir,—These are some points I discoved while in a Latin class. If one divides the maximum speed of a bomber by 3, the cruising speed by 2, the all-up weight by 1,000 and the range by 100, one gets a set of figures which, when added, give the comparative rating of one bomber over another. Range has not been given much importance, because in-flight refuelling will largely offset any of its advantages. Please excuse the paper.—Yours, etc. . . ."

● *"The United States is in a position, because of its wide area, to stand in the way of the development of foreign air lines' world services. To do so would clearly be a blow at the freer competition on which, as the State Department has so often argued, the healthy development of the western world depends."*—From an editorial in *The Times*, discussing the delayed inauguration of B.O.A.C.'s round-the-world services.

I submit that this does less than justice to the official American attitude to B.O.A.C.'s new all-round-the-world services. These services have been approved by the State Department and approved by the Civil Aeronautics Board. The hold-up has been caused by a commercial objection from Northwest Airlines (*Flight*, March 20 and 27).

The American C.A.B. will probably not uphold Northwest's objection—just as they did not uphold that airline's recent back-door attempt to get into Hong Kong by taking over Thai Airways. How easily the American authorities could have said to the British "No round-the-world rights unless you let Northwest into Hong Kong." But they did no such thing.

In other words, an American Government agency has been upholding British interests, and has not been "standing in the way," or protecting its own airlines. And before we complain (justifiably or otherwise) at the way other governments treat our airlines, we should remember what we recently did to K.L.M. in Singapore.

ROGER'S THESAURUS

Like most forms of human activity, aviation has a highly adaptable vocabulary. The definition of certain English words and phrases must be kept carefully up-to-date, otherwise nobody can understand anybody.

Here, therefore, is a selection of up-to-date definitions:—

Jet power: Turboprop power.
600 m.p.h.: 550 m.p.h.
Faulty oil seal: Engine failure.
Management: Shop stewards.
Material diversion: Generation of new traffic.
Non-stop: One-stop.
Pool agreement: Cartel to eliminate competition.
Subject to government approval: Subject of political controversy.
Firm order: Visit to the factory.
Rationalization: Creation of yet a further company.
Profit: Balance before repayment of subsidy.
Competitively priced: Slightly more expensive.
Proven: Obsolescent.
Delivery-date: Date on which an aircraft happens to be delivered.
Supersonic: Any British aeroplane which can pass Mach 1 in a dive.
Acceptable noise-level: Noisy.

I hope to publish further selections from time to time. Your suggestions are invited.

● "The marmalade cat that was placed in quarantine kennels at Hackbridge, Surrey, by the R.S.P.C.A. after being found on an R.A.F. Comet which landed at Lyneham, Wilts, from El Adem on March 4, has given birth to three kittens."—*Reuter, March 24.*

ROGER BACON

THE INDUSTRY

Canadian Rolls-Royce Appointments

THE appointment of Mr. A. M. Scott to the newly created post of chief engineer, Aero Division of Rolls-Royce of Canada Ltd., Montreal, was recently announced, and Mr. K. J. Bhore is to succeed him in his former post of sales manager, Aero Division. The new assignments, states Mr. R. M. Kendall (general manager), are in keeping with the broadening utilization of Rolls-Royce turbojet and turboprop engines in North America, and the preparations for the introduction of new types to that continent. Mr. Scott will have responsibility for all engineering matters, and will concentrate on the more difficult technical problems. Mr. Bhore was previously responsible for Avon turbojet sales engineering in North America.

Mr. Scott *Mr. Bhore*

Ian Maxwell Scott, B.Sc.(Eng.), is a graduate of Aberdeen University, Scotland, and has been associated with Rolls-Royce for 20 years. Following experience with the parent company, he went to Canada in 1950 as technical representative. He was chief test engineer at the Montreal plant before being named sales manager, aero, in 1955.

Kenneth J. Bhore, M.A.(Cantab.), A.M.I.E.E., served in the R.A.F. from 1939 to 1946, being demobilized as a wing commander with the D.F.C. Subsequently he was general manager of Air India International, and later became Director-General of Civil Aviation for the Government of Pakistan. He joined Rolls-Royce of Canada in 1957 to take responsibility for Avon sales engineering in North America.

Simms Acquire Precision Firm

FROM Simms Motor & Electronics Corporation Ltd., of Oak Lane, London, N.2, comes news that they have acquired the whole of the issued share capital of Aircraft Steel Structures Ltd., Western Avenue, Middlesex, of which they have held one-third since 1956.

Aircraft Steel Structures was founded in 1944 in premises in Kensington. Late in 1957 they moved to their present building, an ultra-modern factory equipped to undertake high precision engineering work in all fields. If it can be said to specialize, the company may claim to possess particular skill in work connected with hydraulics and vacuum pumps. The plant, which is valued at a quarter of a million pounds, includes many machines devised and developed by Aircraft Steel Structures themselves.

Goodyear at London Airport

RECENTLY the Aviation Division of the Goodyear Tyre & Rubber Co. (Gt. Britain) Ltd. opened a new building at London Airport for the servicing, repair and overhaul of aircraft wheels and brakes, their associated hydraulic and electrical systems, and for the sale and repair of aircraft tyres and tubes. A remould exchange service is also operated.

The building, which is situated in Viscount Way, at present has a floor area of 5,750 sq ft but room is available for extension. It comprises a two-storey office block with a warehouse and workshop at the rear. The manager of the new centre is Mr. A. G. Brownsill, and the sales and service representatives of the Goodyear International Corporation, Mr. W. H. Snee and Mr. W. Paddy, will also have offices in the administrative block. The telephone number is Skyport 1922.

Goodyear Aviation's new service department at London Airport (see below). Office and service facilities at the airport have been centralized in this new building, which provides facilities for the overhaul of aircraft wheels and brakes and the sale and repair of tyres

Construction of this new facility follows changes that have been made elsewhere in the organization of the Aviation Division. The design group (formerly at Wallasey) and the head office sales and service department have been brought together at Wolverhampton, and servicing of the more extensive type previously carried out at Wallasey will now be done at London Airport. It is understood that an agreement has been negotiated with Electro-Hydraulics Ltd., who will take over the Wallasey factory and will provide production capacity for Goodyear when necessary.

Big Radiant Heater

THE Furnace Division of Birwelco Ltd., of Aston, Birmingham, have been awarded "a substantial contract" by the Ministry of Works for a radiant air-heater for installation at the National Gas Turbine Establishment at Pyestock. Known as a Petro-Chem Iso-Flow furnace, it will be used for air heating in height-simulation testing of gas turbines.

Height of the equipment is 73ft, with an outer shell diameter of 22ft 10in and a radiant surface of 6,500 sq ft. The tubes, made from chrome-molybdenum, silicon steel and stainless steel, are 57ft 6in in length.

IN BRIEF

Westinghouse Brake & Signal Co. Ltd. announce that Mr. George William Dunkley, O.B.E., has been appointed a director.

* * *

Evo-stik "impact" adhesive (Evode Ltd., Common Road, Stafford) is extensively used in the Armstrong Whitworth Argosy for the attachment of plastic coverings—including Vyndide, Texturide and Arlinghide—to the cabin walls and ceilings.

* * *

Petbow Ltd. announce the appointment to their sales staff of Messrs. K. Glensey, I. D. Cockerell and J. L. Rummins as technical sales representatives. Messrs. Glensey and Cockerell will represent the company overseas and Mr. Rummins will be based in London.

* * *

The B.B. Chemical Co. Ltd., of Ulverscroft Road, Leicester, manufacturers of Bostik adhesives and associated products, have appointed Mr. J. W. Trost to be manager of their new overseas department. He will be responsible for export sales and for the interchange of information overseas.

* * *

Burgess Products Co. Ltd., Micro-Switch Division, Team Valley, Gateshead, 11, announce that they have been granted A.R.B. approval for their standard V3 miniature micro-switch. This, they state, is the first time that a micro-switch of any type or make has been approved by the A.R.B.

AVRO DIRECTORSHIPS

Newly appointed to the Board of A. V. Roe & Co. Ltd. (as announced in a news-item on p. 451 of "Flight" last week) are, from left, Mr. S. D. Davies, who is technical director of Hawker Siddeley Aviation Ltd.; and (appointed executive directors) Mr. J. R. Ewans, chief designer; Mr. R. H. Francis, chief engineer of the Weapons Research Division; and Mr. A. Sewart, who is the assistant general manager (missiles), W.R.D.

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

The Altimeter Defended

ALTOGETHER too much publicity has been given to the projected replacement of altimeters; the change has been given an importance quite out of proportion to its value. The presentation may have contributed to faulty readings and replacement may be a reasonable precaution, but the fact must be accepted that it is the use and not the instrument which is at fault.

The outstanding cause of accidents is personal error—in several recent cases attributed to incorrect reading of the altimeter.

For at least five to ten minutes not one member of a crew knew the correct aircraft height within almost two miles—this by personnel fully aware of the danger of erroneous readings, and whose physical, academic and training standards could hardly be improved.

A disturbing situation, and one unlikely to be improved much by replacement of an instrument.

You have been kind enough to print my suggestions for cockpit rationalization; please allow my further insistence in this case. By all means improve altimeter presentation, but safety would be more certainly provided by alleviation of the demands forced on a captain by custom and prestige. Under the captain's direction delegate all flying to a crew member with no other duty to perform. Give the captain time to breathe, to think, to use his experience—and to stay alive.

Woking, Surrey. H. T. THOMPSON.

Boeing 707 Incidents

THE letter from Mr. Ginsberg (*Flight*, March 20) finished with a smart slap in the face for the British aircraft industry. I feel that it was unjustified.

Confidence in the products of our industry has been with us from its inception, otherwise it would never have survived. It was confidence of a far higher order than that currently shown by the Americans which retained the R.C.A.F. Comets in service when those of B.O.A.C. and Air France were withdrawn.

I think that the 707 occurrences were not enough to cause grounding of the type, due to their order and nature. In the February 3 incident the loss of height was at first attributed to the autopilot, and suitable safeguards could be made in flight pending a detailed explanation. The loss of an engine and pod I regard as far less serious, as it was a structural failure which happened in a manner expected under such excessive load conditions.

With the competitive stakes as high as those prevailing at present, it would need something drastic to ground the 707. I consider that the decision of the Americans reflects their finances rather than their confidence.

Bramhall, Cheshire. R. A. LAWRENCE.

Fluorescence: An Early Advocate

I AM looking forward to seeing *Flight's* Gemini G-AKHC dolled up in the latest Day-Glo orange, and must congratulate Mr. R. D. Breslain of the R.O.C. on his keen observations [see p. 418, March 27]. I therefore suggest that *Flight's* Gemini should have a *complete* coat of fluorescent orange; such a finish would help to talk-down an aircraft flying in adverse visibility. In December 1949, when I was a member of the R.O.C., I raised the points about Day-Glo colours—and again in *Flight* (Correspondence, June 29, 1956)—but no one seemed interested. However, I am too old a bird to claim to have originated this idea: way back in 1911 Anthony Fokker, while flying his Fokker *Spin*, noted that oranges on barrows in the streets were the most noticeable things visible from the air. In the interests of flying safety I consider Day-Glo finish on aircraft vital.

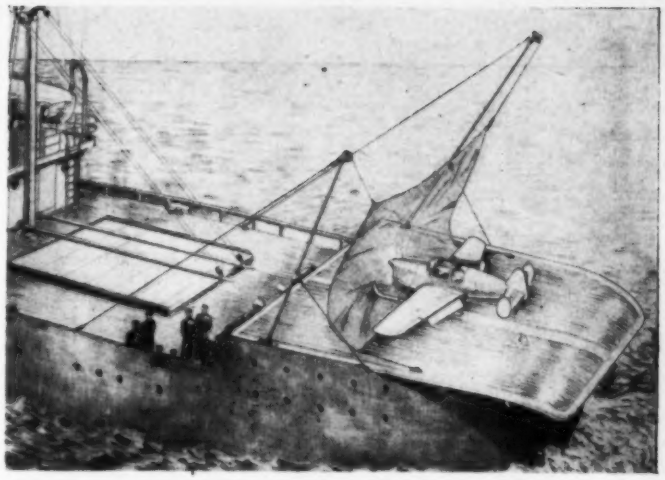
Birmingham 14. MAURICE AUSTIN.

Arrester Nets

I WAS interested in the photographs of the net landing on H.M.S. *Eagle* and the reference to arrester nets at Gutersloh in your issue of March 20.

Enclosed are illustrations from a proposal for anti-submarine measures which I submitted to the Ministry of Aircraft Production and to the Admiralty early in 1943 (in one of these the artist has omitted the slot which was necessary for propeller-driven aircraft). These proposals appear to have been the origin of arrester nets and barriers of the type now in use and, to some extent, may have suggested the angled deck.

In April 1943 I carried out landings into a prototype net erected on the aerodrome at Woodley as a demonstration of the practical nature of the scheme before Sir Stafford and Lady Cripps,



The deck-landing net device evolved in 1943 by Mr. G. H. Miles. In this sketch, as he points out in a letter below, his artist has omitted to show provision for propeller clearance in the net; the correct arrangement is seen in a photograph overleaf

Air Marshal Sir Philip Joubert, Commodore Slattery, Professor Blackett, the Hon. J. P. Maclay and other officers and officials. One test, partly to demonstrate that heavier aircraft than the Messenger could be arrested in this manner, was carried out down-wind. Subsequently, encouraged by the very satisfactory initial results, I flew into the net while still airborne; the previous touch-downs had been made some 20 to 30ft ahead of the impact point.

Unfortunately, the scheme was not put to use during the war, the official verdict being that it was impracticable! Our request to be permitted to rig a net for trials on a towed float or Naval vessel was refused and we consequently made arrangements with Mr. Billmeir to carry out unofficial trials on one of his Stanhope Line freighters as a private venture. Under war-time regulations, however, official permission had to be granted and this we were unable to obtain.

Shoreham Airport, Sussex. G. H. MILES.

Mythtory

CONTRARY to popular belief the naming of aircraft *has* a logical basis. Now our Theseus is that the Greek gods, always being airy creatures, are today reincarnating themselves in the modern devices which, in an awe-inspiring manner, are able to proceed in what to the uninitiated must seem a godlike means from A to B (or should it be Alpha to Beta?). Our sky is continually being filled with aircraft, and engines, whose nomenclature is obtained directly from the Greeks—whom we are told *always* had a word for it.

By authoritative reference we know that Jupiter had sixteen wives, the twelfth being Maia. As we shall shortly see, her son by Jupiter was Mercury. Bristol, not having availed themselves of our vast knowledge (?) of the Greek mythological genealogical table, have unwittingly upset the order of derivation of offspring. Had we been consulted we could, with pleasure, have informed them that Perseus came before Hercules, who preceded Mercury. Somehow the order appears to have been reversed in the West of England—perhaps they have forgotten their classics? This latter view becomes a greater possibility when we consider the fall from the Mount of Olympus to the underworld wherein we find Orpheus.

When one considers these names one cannot help wondering what memories exist in Greece, and what a stir might there have been in Athens had the Apollo become a regular visitor.

That last name reminds us that while we have been crediting Bristol and Short with classical leanings there are others. Let us consider Armstrong Whitworth. The Apollo was only one of a line which included Atalanta. It is true that the Apollo was not A.W.'s golden chariot, as we know. However, Coventry returns to the battle with the Argosy. Had it been Argo only, and had Rolls-Royce renamed the Dart Jason, then surely the Golden Fleece would have arrived at Bagington.

And now that the Mercury engine is more or less defunct think not that that wingéd harbinger is quiet! When we remember that he also featured in Greek letters as Hermes, we can see that he is not yet totally non-existent. But Mercury also masqueraded under two other names, and these we offer free of charge to any manufacturers. One we feel to be very applicable to a new jet bomber for this atom age—Psychopompous (leader of the souls to hell), and the other would probably be more desired by a perfume manufacturer—Oneicopompous (leader of dreams). While on this side track, what of Terpsichore for that aircraft which features Mozartian music as proof of cabin quietness? [*contd. over*

CORRESPONDENCE . . .

The use of Hermes by Handley Page is not mere chance. Many of the H.P. lineage have borne the illustrious names of the classical days. The Heraclean strength of the renowned Hannibal, and its Marathon performance, show that what was sauce for the Greeks was O.K. for H.P.

But hold! Here is the whisper of a star which was eclipsed—perhaps only temporarily. Mayhap it will yet Blossom again, and with what effects on our Grecian genealogy and Students thereof. After all, did not those heavenly twins Castor and Pollux, known as Gemini, reappear Reading off the Miles? Or will the new Worthing branch be more to Roman ways bent?

We deviate. Among those who dabbled with the classics, as we have already seen, are Short. Mercury and Maia we have mentioned. But what of Scylla or Scipio? But we fear that desertion of boats has caused Short to leave the classics and search in modern terms for the ideas that take place on time.

One of our few lightplanes today bears the illustrious name Auster, although why it should be a south-west wind we know not. Perhaps the makers foresee a long life for their product, since Auster was a son of Aurora, who was a consort of Apollo. Got around, didn't he?

We should have thought that Fairey, with their predilection for large greenhouse-type enclosures, would have fancied Argus the myriad-eyed rather than Fairchild! And as that last name has transported us across the Atlantic, it will be appropriate to say how heroic Canadair were in producing the Argonaut. Lockheed, too, have explored the Grecian world but usually in a starry-eyed manner with Orion, and Sirius and Vega, but even they were obsessed with Jupiter. So much so that twice have they wedded themselves to Electra—one assumes that they felt her offspring Dordamus would not have suited the second of these.

But the Americans in general are not classically-minded, and we must return to our own West Country and Westland to find that a two-legged dragon with a barbed tail (Wyvern) is linking us once again with Apollo—for see here also is the Python! Nor can we forget, too, that Lysander springs from here, as did the Pterodactyl.

Earlier we mentioned Jupiter's wives and offspring, and now we can note that Avro have taken one of his offspring and are busy hammering out Vulcans!

This little study of how the Greek gods keep their names alive in our memories today is far from complete, and no doubt those of greater classical ability than ourselves may suggest many more thoughts along this same course.

We trust it has amused those not directly concerned with dreaming up names for the latest creation, and perhaps encouraged those that are to reconsider Greek mythology as a source. This does not mean to say that we expect to see a Bacchus cavorting about the skies, but surely the lines of Juno were of sufficiently heavenly beauty that de Havilland's could consider her for further variants of the Comet!

St. Albans, Herts. J. GREENING.

The Twin-jet Airliner

I READ with a great deal of interest the note under the above heading on p. 334 of your issue of March 6. I hope you will permit me, an expatriate, to express surprise at one or two points.

First, I think you have woven the British-American "jet airliner pattern of the future," as you call it, somewhat crazily from the British point of view. Why, for example, do you bracket the D.H.121 with the Convair 880? I cannot see what British European Airways would be wanting with 24 airliners of 880 calibre—unless they wished to take over B.O.A.C.'s routes! The 880 has an optimum design range of 1,500-2,000 n.m., a gross weight of 180,000 lb, and seating for 130. The D.H.121 should surely be in the third column of your table, classified as a very much smaller jet.

Secondly, you quote Mr. B. S. Shenstone of B.E.A. as saying that this kind of smaller jet ("*circa* 100,000 lb") is the object of "average airline" thinking. Surely this is how the D.H.121 should be classified, because this is what B.E.A. need, and it is the aircraft for which the biggest potential market exists, as Douglas and Boeing (as you say) know.

Thirdly, you advocate the twin jet; but to my mind the twin jet airliner is, from the design viewpoint, merely a single-engined airliner with a second engine for luck.

Nebraska, U.S.A. R. J. F-T.

FORTHCOMING EVENTS

April 10. Helicopter Association: "French Helicopter Developments," by L. F. G. Legrand.
April 14. Institute of Metals: "Scientific Use of Space Exploration," by Prof. F. Hoyle.
April 15. Aircraft Recognition Society: a.g.m.
April 17. Institute of Navigation: "The Dectra Trials," by Col. C. Powell.
April 21. R.Ae.S.: All-day Discussion on the Structural Effects of Kinetic Heating.
Apr. 21-23. International Airline Navigators Council: Ninth Annual Convention, New York.
April 22. Women's Engineering Society: "Development of the Gas Turbine Engine," by A. B. McKenzie.
April 23. R.Ae.S. Astronautics and Guided Flight Section: "Earth Satellites," by W. H. Stephens.
April 24. Fourth Tangier Rally, Morocco.
Apr. 28-30. French and British Institutes of Navigation: Symposium on Automatic Navigation, Paris.
May 2. British Interplanetary Society: "Inertial Guidance and its Application to Astronautics," by D. J. Cashmore.
May 2. Aerial At Home, Woburn Park.
May 4-14. I.A.T.A. Technical Conference, Berkeley, Calif.
May 5. R.Ae.S.: "The Potential Use of Aircraft for Agricultural Purposes," by R. H. Scott.
June 12-21. Paris Aero Show.
Sept. 7-13. S.B.A.C. Display and Exhibition, Farnborough.

R.Ae.S. Branch Fixtures (to April 14): April 13, *Glasgow*, a.g.m.; *Halton*, "Some Experiences of an Airline Pilot," by Capt. O. P. Jones. April 14, *Brough*, a.g.m.; *Coventry*, a.g.m.

For Black Read Blue

AS one who tries to draw aeroplanes I have long admired *Flight's* presentation of Leonard Bridgman's beauties (when do we get some more?) and Dennis Punnett's three-view drawings. In connection with the latter, congratulations on the Boeing 707 in your March 27 issue; may I, however, point out that on American Airlines' 707s the thin lines on fuselage and engines, and the lettering, are dark blue and not black as stated?

London, W.14. JOHN STROUD.

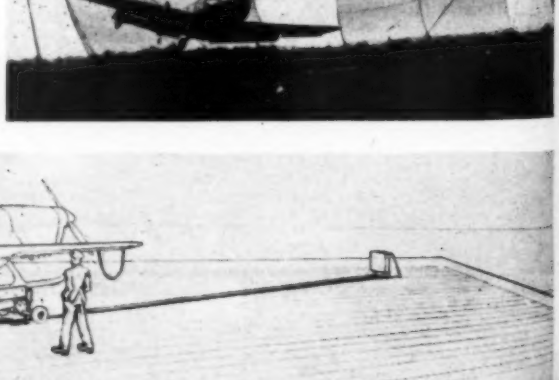
IN BRIEF

S/L. J. F. G. Stonham, D.F.C., is compiling a pictorial history of No. 76 Sqn. (of which he is O.C.) and would like to hear from ex-members who may be able to provide photographs relevant to any stage of the squadron's history; he adds that he is particularly short of material for the periods 1937-40 and 1945-46. Letters should be sent to S/L. Stonham at No. 76 Squadron, Royal Air Force, British Forces Post Office, 151.

* * *

Mr. I. Purnell, of 9 Elmore Avenue, Lee-on-Solent, Hants, has a 1911 book entitled *The Aeroplane—an Elementary Textbook on the Principles of Aerodynamic Flight*, by I. O'B. Hubbard, C. C. Turner and J. H. Ledeboer, B.A., which he wishes to give away. "In fairness to overseas readers," he writes, "I will delay my offer for one month after this note appears and will then send it to the writer of the letter giving me the most convincing reasons for wanting it." He adds: "No callers, please."

Two more views of the Miles deck-flying scheme referred to on the previous page. Above, the Messenger is seen about to enter the net; below is a launching system in which the aircraft is skid-mounted on the catapult trolley and lifts clear when the latter meets a stop



Shoals of production jet airliners are seen in these two recent pictures from France and America. On the left, Sud Aviation Caravelles for the national operator Air France and for S.A.S. They are "au stade de la mise" at St. Martin du Touch. Right, Boeing 707-120s for T.W.A. American and Qantas. B.O.A.C.'s first aircraft should fly on May 1

AIR COMMERCE

COMMERCE URGES COMPETITION

ABOUT a year ago the Association of British Chambers of Commerce set up a working party to find whether "the whole future development of the United Kingdom's air transport is being adversely affected by the present licensing system." In general, they conclude that it is, and that the interests of the travelling public are being subjugated to the interests of the Corporations. In particular, the Association (who have adopted the recommendations of their working party) feel that restrictions on the routes served by independent airlines are not in the best interests of the business community " . . . as it undermines the British effort in this international industry."

In the belief that it would improve "British effort, both in ingenuity and weight" they would like to see much greater competition on all routes at the moment served by one British operator, or at least wherever international agreements allow it. And on services between U.K. provincial centres and Europe they recommend that any operator who meets the required operational standard should receive a licence if he wants one.

This suggestion of virtually unlimited competition is tempered by the Association's proposal for an A.T.A.C. with statutory powers to regulate frequencies, fares and amenities and to negotiate traffic rights. They suggest that reasons for refusal of a licence application should be given and that there should be the right of appeal. Another suggestion is that there should be a Ministry of Civil Aviation as distinct from the Ministry of Transport.

Among the conclusions of the Chambers of Commerce is that direct links between provincial centres in Great Britain and Europe have been stultified by exclusive reservation to B.E.A. of services out of London, and that B.E.A.'s financial position has hampered aggressive development of United Kingdom internal services.

The report makes a strong plea for better opportunities for the independent airlines, although sufficient weight is perhaps not given to two points: (a) on all but two or three routes can U.K. domestic traffic be carried economically when reasonable frequencies are offered? and (b) competition does not necessarily create new traffic.

NOISY NONCONFORMISTS

WHEN, last autumn, the Port of New York Authority approved jet operations at Idlewild it promised that they would be kept under review. Now it appears that the P.N.Y.A. has been as good as its word.

During the five-month period ending February 28, the Authority's engineers have monitored 812 jet take-offs. All but 83 conformed to the prescribed procedures (described fully in *Flight* for October 17, 1958). B.O.A.C., it seems, made 116 Comet 4 take-offs only four of which (3.45 per cent) did not conform to the procedures. Pan American made 346 Boeing 707-120 departures, with 16 non-conforming (4.6 per cent); and National made 158 707-120 take-offs, of which 19 were non-conforming (12 per cent). To these airlines Mr. John Wiley, P.N.Y.A.'s director for aviation wrote: "We know you will be pleased, as we were, by this evidence of your co-operation and genuine concern for the welfare of the airport's neighbours." To American Airlines, however, he pointed out that their "regrettable record" of 707-120 non-conformity was 22 per cent—"indicating that American is not doing its share in the overall noise-reduction effort."

Have the Comet 4 and 707-120 take-offs from London Airport been similarly monitored by the British authorities?

When the operation of the 707-120 from London was approved last autumn (October 31 issue) is was said to be "subject to review." Asked about British monitoring procedures, the M.T.C.A. last week referred to the Joint Parliamentary Secretary's statement in the Commons on February 2: "We have been monitoring take-offs and landings whenever conditions permitted . . . I can assure the House categorically that we are keeping a very close watch on the conduct of these operations . . ." The Ministry were, however, unwilling last week to issue any figures to compare with those of the P.N.Y.A.

Two other questions raised with the Ministry were: (1) Are jet operations at London still "waking hours only?" (2) What precisely are the "operating techniques and procedures" which the Tu-104 will employ to "minimize disturbance" at London Airport, and which have suddenly resulted in acceptance of the aircraft after a year's delay?

The answer to the first question was that it still does not arise, because B.O.A.C. and PanAm have not scheduled outside waking hours. If they wish to do so, or if training flights have to be made during sleeping hours, Ministry permission would be required.

But observant newspaper-advertisement readers will have noticed that PanAm intend, from April 27, to schedule a daily 707 departure from London at 1.30 a.m. Earlier this week a PanAm spokesman said that the M.T.C.A. had been advised of this schedule.

So far as the Tu-104 is concerned the Ministry declined to publish any details of the Soviet-proposed Tu-104 procedures, except to say that the runway to which the aircraft will be confined while its operations are reviewed is 28L. (Details of Aeroflot's Tu-104 noise-abatement techniques appeared in *Flight* for October 3, 1958.)

It is of interest to recall the words of Mr. Ronald Bell (Con., Buckinghamshire, South) in the Commons on February 2. He reminded the House that it is legally impossible for a member of the public to bring an action of nuisance against the owner of an

Now sales-touring America (see last week's issue), the Canadair 540 —sometimes known as the Napier Eland Convair—has already demonstrated a flight-manual performance better in most respects than the brochure. Sample comparisons (with brochure figures in parentheses) are: take-off weight in I.S.A. + 15 deg C at 2,500ft, 53,100 lb (51,100 lb); runway length, s.l., I.S.A. at 53,200 lb, 4,550ft (4,650ft); landing distance, s.l., 38,000 lb, 3,350ft (3,675ft); fuel-consumption, 20,000ft, I.S.A., 38,000 lb, 11,500 r.p.m., 3½ per cent down

AIR COMMERCE . . .

aerodrome. "The Ministry," he said, "goes through the motions," imposing jet-noise limitations and restrictions for a time, and then throws the door wide open. "If one imposes a restriction and keeps it there, the aircraft manufacturers and the airline operators will very soon find the answer. If we do nothing, they will do nothing. We shall have the old story going on of our having to accept changes in the advance of the modern world, learning to put up with noise and liking it."

ACCIDENT STATISTICS

SOME earlier comments on these pages (*Flight*, January 16 and February 6, 1959) have referred to the lack of any organization responsible for compiling accident records on an airline-by-airline basis. I.C.A.O. issue statistics on a basis of member States and on the two dates given above *Flight* published a compilation of facts about accidents that occurred in 1957 and 1958. Below are statistics for member airlines of I.A.T.A. from 1952 to 1957. They are comprehensive only in so far as they cover airlines that reported. They indicate that the last year to appear on the table was a particularly good one measured by any standard. Non-reporting airlines are thought not to have suffered accidents.

COMPARATIVE SAFETY STATISTICS OF I.A.T.A. MEMBER-AIRLINES 1952-1957

	1952	1953	1954	1955*		1956	1957
I.A.T.A. membership	67	70	71	73		76	81
Members reporting	64	68	70	72		74	71
Members reporting no fatal accidents	52	48	54	53	(55)	55	56
Aircraft miles on revenue flights (millions)	805	921	984	1,094		1,222	1,351
Revenue passenger miles (millions)	20,921	25,083	28,520	33,487		38,734	43,488
Revenue passengers carried (thousands)	32,638	39,485	44,296	51,666		58,368	64,508
Aircraft accidents involving fatalities	16	25	21	23	(20)	24	20
Number aboard: Crew	77	118	118	109	(89)	129	81
Passengers	401	463	400	487	(386)	666	336
Total	478	581	518	596	(475)	795	417
Killed: Crew	61	80	81	81	(64)	86	62
Passengers	295	299	318	355	(254)	491	273
Total	356	379	399	436	(318)	577	335
Injured: Crew	7	20	21	23	(20)	23	3
Passengers	104	48	29	85	(85)	54	28
Total	111	68	50	108	(105)	77	31
Third parties killed	11	5	1	2	(2)	2	2
Passenger fatalities:							
Total	295	299	318	355	(254)	491	273
Average per accident	18.4	12	15.1	15.4	(12.7)	20.5	13.65
Per million passengers carried	9.04	7.57	7.18	6.87	(4.92)	8.41	4.23
Per 100 million passenger-miles	1.41	1.19	1.12	1.06	(0.76)	1.27	0.63
Passenger miles per passenger fatality (millions)	70.92	83.89	89.69	94.33	(131.84)	78.93	159.3

*Figures in parentheses exclude accidents caused by sabotage and attack.

PROGRESS WITH "EUROPAIR"

TALKS among the national carriers of the Common Market countries "have made good progress," said Mr. I. A. Aler of K.L.M. in Amsterdam on April 2. He was returning from a two-day conference in Rome, the third meeting since February (see *Flight*, February 27 and March 6). According to reports, the "partial integration" will definitely be known as Europair; and this body will come into being in stages from January 1, 1960. While retaining their independence, the airlines concerned would gradually lose their identity and fly in Europair markings. There are reports of controversy over the sharing of revenues and the allocation of capacities, and about the rate of relative growths within Europair. The agreement, it is said, would probably cover a 70-year period. Mr. Aler said that more talks would be held at The Hague at the end of this month.

WEATHER RADAR PACK

A SELF-CONTAINED kit assembly, known as the Weather Radar Pack, has been developed by R.C.A. for their AVQ-50 lightweight weather radar and is to be marketed in Britain by R.C.A. Great Britain Ltd., by Marshalls Flying School Ltd. and by W. H. Sanders (Electronics) Ltd., who are sub-distributors. The AVQ-50 itself (described in *Flight* for April 12, 1957) has been installed in a wide variety of aircraft, including many of the American light twins. The kit consists of a pressurized package housing the two containers and holding the aerial assembly on its forward face so that the whole system can be readily installed within a small radome. A complete AVQ-50 pack costs £3,800.

The AVQ-50 weighs less than 100 lb and has a low power-drain. A 5in indicator, incorporating all controls for the system, can be mounted on the instrument panel or, alternatively, a 3in instrument-sized indicator can be used with controls mounted in a second 3in dial. Contour or normal presentation can be selected, together with aerial tilting 10 deg up or down and range settings of 20 and 80 miles.

ROUND-THE-WORLD DOUBTS

SINCE our note under the above heading on March 20, B.O.A.C. have flown but not consummated a round-the-world service.

On April 1, a Comet 4 opened as planned the new eastwards service to Tokyo; previously a Britannia 312 had left London to fly westwards to Tokyo via New York, San Francisco, Honolulu and Wake. The link-up took place at Tokyo after Britannia passengers on the Pacific sectors had been carried free.

As this issue appears, the C.A.B. are reconsidering Northwest's objection to the Tokyo-San Francisco link. Meanwhile, B.O.A.C.'s managing director, Mr. Basil Smallpeice, said in Tokyo on April 3 that he thought there had been "undue" delay in getting C.A.B. approval. Northwest, he said, operated flights from New York through Seattle to Tokyo, "but it does not serve San Francisco or Honolulu: its traffic is mainly different from that of B.O.A.C. . . . nevertheless Northwest Airlines complain of potential competition."

Even if the C.A.B. overrule Northwest's objections, that airline could, it is understood, appeal to the courts. But as suggested in our issue of March 27, Northwest would immediately drop all their objections if granted Hong Kong traffic rights. A lengthy M.T.C.A. statement last week hinted that this might now be "discussed" in return for prompt settlement of B.O.A.C.'s problem. Northwest appear to have made their point. And, quite by chance, B.O.A.C.'s round-the-world service has received much valuable publicity.

(Left) Installed in the nose of a Viscount is the AVQ-50 weather radar described above

(Right) Seen here with Westland test pilot S/L. Leo Devigne is Mrs. Caroline Oboussier, designer of Westland's Battersea heliport. It is to be opened by Mr. John Hay, Joint Parliamentary Secretary to the M.T.C.A., on April 23

SELLING THE DART HERALD

LAST week, during a demonstration day-trip to France in the Handley Page Dart Herald, "Flight" heard news of progress with the test and production programme and was given some hints of possible future developments, as discussed in this article. An ambitious sales tour which will take in India, Pakistan and the Middle East—the first of four extensive tours covering all the continents—is now in progress.

TARGET DATE for full airworthiness certification of the Dart Herald—a special-category C. of A. is at present held—is March 1960, and production deliveries of the standard aircraft could be made at that time against orders placed now or in the near future. Selling price of the aircraft is still some £40,000 cheaper than its nearest competitor, the comparably powered (RDa.7) Fokker/Fairchild Friendship at about £225,000. The first true production Dart Herald is already well advanced, and is expected to fly in about four months' time.

On the structural front, the Dart Herald's pressure cabin is cleared by the A.R.B. for a safe service life of 30,000 flights, and continuing structural tests in the tank at Farnborough are confidently expected to demonstrate a safe life of at least 60,000 flights. Actual pressurization cycles so far achieved are 44,000 at 4.2 lb/sq in: this is considered to be equivalent, due to the character of the S-N curve, to 88,000 cycles at 3.35 lb/sq in—i.e., normal Dart Herald cabin pressure. A scatter-factor of 2.0—determined from the demonstrated fail-safe design properties of the fuselage structure—and an average flight time of about one hour thus give a safe life of about 44,000 hr.

This is considerably in excess of anything previously offered to the airlines; and at the present rate of progress the Dart Herald's approved pressure cabin life can, for all practical purposes, be expected to be infinite. Demonstration of the fail-safe properties of the design are said by Mr. John Allan, chief designer of Handley Page (Reading), to have been "most gratifying." The usual deliberate saw-cuts were made at critical points in the structure after 32,000 hr at 4.2 lb/sq in, and crack-propagation properties were considered to be excellent. More cuts will be made after 60,000 cycles (i.e., 120,000 flights at working pressure), at which point a test to twice 4.2 lb/sq in will be applied, so allowing 30,000 flights at 4.2 lb/sq in. Critical saw-cut points, incidentally, were chosen from the results of an elaborate programme of stress-measurement, involving the application of some 2,000 strain gauges. (Normal working stress level of the pressure cabin is 8,000 lb/sq in rising to not more than 15,000 lb/sq in.)

Meanwhile H.P. are engaged in demonstrating the static strength properties of the wing. A cycling test will be applied to a new wing, and H.P. are more than confident, from experience of specimen tests, of the fail-safe properties of the design (see *Flight*, May 2, 1958). As with the fuselage, cuts will be made after a certain number of cycles, and a proof test carried out.

One of the strongest Herald selling points, and one which will be emphasized during the forthcoming tours, is the solid integrity of the structure. This is something one senses even from a look. Last week *Flight* had its second recent in-flight experience of the aircraft (see April 3 issue), this time as a passenger. Having also recently flown as a passenger in the Friendship, an interesting comparison was possible. Noise and vibration levels are so close as to be indistinguishable—unless one happens to be carrying one's own personal sound and vibration measuring equipment. Quietness and vibration free-ness are relative terms: by comparison with the DC-3 which these aircraft are to replace—and the DC-3 is remarkably good from these viewpoints—the Dart Herald and the Friendship are most acceptable. The particular difference of the Dart Herald is the definite feeling it conveys of a bigger, heavier airliner. To have achieved docile, light-aeroplane handling qualities in an aeroplane with this "feel" must be regarded as a most satisfactory achievement. "There are no vices of any sort," S/L. Hazelden says, and this was the view of one of *Flight's* pilots, C. M. Lambert, in his handling assessment of two weeks ago.

So far about 300 hr of Dart Herald test-flying have been logged (effectively with one aircraft) since the first flight in March 1958; previously about 400 hr of Leonides Herald flying had been completed. Handley Page assess the airworthiness flight test programme as requiring a further 120-150 hr. Main item remaining to be completed is the Flight Manual associated with the full type certificate. Though all the figures are now established they have to be remeasured to a high degree of precision for the Flight Manual; in this fining-down process H.P. expect, incidentally, some substantial improvements in payload-carrying capability. It is possible, though initial certification will be at a maximum weight of 37,000 lb, to anticipate compliance with requirements at 38,500 lb. Among the remaining items in the flight-test programme is the measurement of take-offs and landings in temperate and tropical conditions. For example, 30 or 40 engine-out take-offs will be repeated to measure, with greater precision, single-engine climb gradient.

The confidence which H.P. show in their private-venture (£3 million plus) product was infectiously felt during last week's tour-preview to France. It was followed on the next day by a non-stop flight to Rome, where the aircraft was demonstrated to Italian Air Force and airline chiefs.

The next few months will be devoted to a really all-out effort to sell to the customers on their home grounds: after the current tour of India (where a Hindustan Aircraft licence-to-build contract is a strong prospect), Pakistan and the Middle East the aircraft will go to South America. Later in the summer the first production Dart Herald will visit Australasia, and subsequently Africa and Central and North America.

How long H.P. will be able to continue privately to finance development and promotion of their product without orders remains to be seen. Perhaps this thought is uppermost in the minds of H.P. people, but it is never expressed. Their belief is that they have the best aeroplane of its class and their confidence in it could not be more convincingly displayed than by the ambitious—and expensive—sales tours now in progress and planned. "If I had to design the Herald again," said Mr. John Allan last week, "it would come out much the same."

That the Dart Herald is an aeroplane with a future is evident from the way in which H.P.'s designers foresee its development. They say it has a greater potentiality for easy growth than most: the next version of the ever power-increasing Dart is the RDa.10, of 2,660 e.h.p.; though H.P. emphasize that the present RDa.7 (2,100 e.h.p.) Dart Herald is the one which is for sale, a civil RDa.10-powered project weighs 44,000 lb, and a military Dart Herald project with this powerplant (and incidentally with tunnel-tested rear-door air-dropping capability) weighs 46,500 lb. Projecting way ahead, there seems no reason why Dart Herald weight-growth should not eventually rise to around 50,000 lb, with appropriate strengthening, or why for special high-density short-haul work a 70-seat version should not be possible. Seven more seat rows would require a 21ft fuselage stretch, which is geometrically feasible with of course all-round strengthening. Such increases in size and strength can be achieved with the existing jigs and tools. That there is a market for such an aircraft is suggested by the recent Japanese preoccupation with the RDa.10-powered YS-11 airliner project (February 13 issue).

Meanwhile, H.P. are doggedly determined to succeed with the Dart Herald of today, for which they predict a potential market of 500 over the next 10 years.

J. M. R.

Handley Page executives relax at Le Touquet during last week's demonstration (Sir Frederick is on the right, S/L. H. G. Hazelden is on the left). Above, embarkation scene at Le Touquet
"Flight" photographs

Aer Lingus crews at Dublin now receive their pre-flight weather briefing on closed-circuit TV (installed by Philips). Two camera chains, with a common monitor in the met office, send information over a co-axial cable to the operations room, where a 21in receiver is installed. The display shows weather charts covering Europe and the Atlantic, with the isobars, fronts and coastlines. There is two-way speech communication. A Mufax "electronic facsimile" system gives the pilot all his information in the form of a folder in the operations room a few minutes before take-off

AIR COMMERCE . . .

CAPITAL'S VISCOUNT DEBT

FOR the second time Capital Airlines have sought a postponement of their debts to Vickers-Armstrongs and Rolls-Royce. According to the company's annual report, payments on notes due in 1959 amounting to $12.2m, and one on notes totalling $5.1m due in 1958 but not paid, will be deferred if negotiations now in progress are successful.

The original investment in the fleet of 60 Viscounts was $70m, on which payments of $27.5m have so far been made. The notes bear interest at 1¼ per cent in excess of the Bank of England rate at the date of payment (not to exceed 6½ per cent) and were due in monthly instalments over a period of five years. To secure the notes Capital executed a chattel mortgage covering all flight equipment, which contains covenants relating to, among other things, the maintenance of Capital's net worth at not less than $10m. In an amendment to the chattel mortgage to cover the required postponement a restriction would be placed upon the notes to prevent the purchase by Capital of new aircraft—which presumably includes the Convair 880s—or the leasing of aircraft without the approval of the note holders.

AN INDUSTRY IN DEBT

AN article in *Aviation Week* reports remarks by Mr. T. Carl Wedel, a vice-president of the first National City Bank of New York, on the present outlook for the U.S. airlines jet financing programme.

He puts the total amount to be borrowed as about $1,400m, of which rather less than $500m is long-term debt. The combined net worth of the industry was rather less than $850m at the end of 1958. Financing deals are generally 45 per cent of borrowings from banks and the balance primarily from insurance companies. This would give $600m as the total loans from banks and $800m from insurance companies, of which the latter are on a "long maturity" basis. A depreciation life of ten years would mean a yearly depreciation of $220m, plus perhaps another $100m from the depreciation of assets other than flight equipment. This compares with a 1958 depreciation figure of $200m. It is contended that the new aircraft have only to break even to exceed the bank debts by a substantial margin.

Mr. Wedel thinks that "if the initial years of the jet age prove successful, there is no reason to assume that lenders would not again be willing to consider . . . the airline potential for borrowing additional funds in the 1960s." For the present, however, "if banks hear of any airline-manufacturer negotiations they ask the manufacturer whether the airline purchasing people have had any talks lately with their financial vice-president—which usually dampens the negotiations quickly."

THE HARD CURVE OF LEARNING

AFTER more than ten years' airline experience of British turboprops, and some previous knowledge of jet operations, it is sometimes very easy for those of us in this country to overlook the intense interest with which early operations of U.S. turbojets and turboprops are regarded on the other side of the Atlantic. This is not to suggest that there is any room for complacency; experience has an unpleasant habit of becoming dated, and mounting operations of the U.S. product represent a valuable supplement to hard-come-by knowledge of our own. A first analysis suggests that technically U.S. turbine operations are going fairly well.

The incidence of systems-failures in the Boeing 707, Electra and F-27 seems to have been fairly low in proportion to failures in engines or airframes. According to *American Aviation* there have been five instances of serious hydraulic malfunctioning reported on the 707, primarily due to hydraulic pump or reservoir failure. In the most serious, an aircraft lost all its hydraulic pressure and on landing blew out two tyres and damaged four others. On training flights, some brake overheating has been experienced and liquid-cooled brakes have again been suggested.

Water-injection troubles have also been responsible for some unpleasant experiences, notably in one case where all four engines flamed-out when the power levers were opened for take-off—incorrect adjustment of the water-valve motor after malfunction on the previous flight caused it to operate at 70 per cent instead of 90 per cent full power, and combustion was doused by excess water.

Another case of flaming-out, in this case on two engines, occurred as a result of about a gallon of water leaking past a seal into an engine nose-bullet. When compressor-bleed de-icing air was turned on the water was injected into the engines. Temporary remedies subsequently recommended by Pratt & Whitney were that the de-icers should be turned on one at a time and that the igniter plugs should be kept on until after the aircraft had reached 5,000ft. This may result in a reduction of igniter plug life to 500 hr; meanwhile inspections are being carried out at 150 hr.

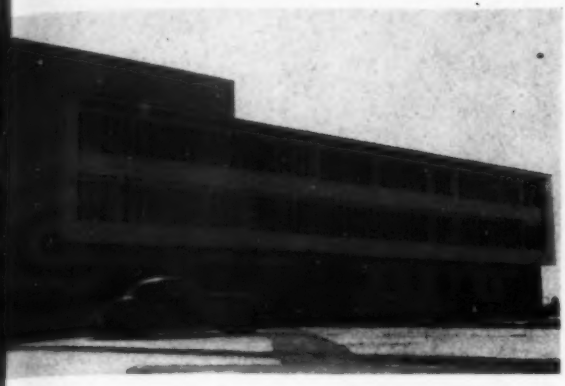
The 707's Pratt & Whitney JT3C-6 engines have established an overhaul life of 1,000 hr in PanAm service after pulls at 800 and 900 hr, and an extension of life is being considered. As with the Dart, the actual life will vary with each operator. Excluding the shedding of an engine over France, there have been five premature removals, all from unrelated causes. In one case a turbine blade failure caused a more serious failure when vibration cracked an oil pipe feeding a shaft bearing. More experience has so far been gained with the JT3 than with the Allison 501-D13 turboprop, but this engine should also have a confirmed overhaul life of 1,000 hr after pulls at 800 and 900 hr. Electra troubles have included vibration (see *Flight* last week), two cases of partial failure of the nose undercarriage, and at least twelve cases of cracks being found in pressurization ducts. Several cases of loss of cabin pressure resulted from the last-named defect, which has been cured by welding pending re-design. There have also been a number of electrical failures; most of them have been minor, but in some cases fire warnings have been operated.

Four cases of auto-feathering have been reported with the F-27, all from separate causes, and soon after regular services began some cracks were detected in the dorsal fin and several stringers.

The two most serious incidents to occur in the first U.S. turbine half-year, the accident to an American Airlines Electra approaching Newark and the Boeing 707 dive incident over the Atlantic, are still under investigation.

A Swissair subsidiary company, Swissair Photo A.G., has purchased a Dornier Do 27 for aerial photography and map making, formerly the sole province of the Federal authorities. It was delivered last month

First aircraft to be seen in the colours of the recently formed independent airline Falcon Airways is Viking G-AHPG, pictured here at Hurn. The aircraft formerly belonged to Independent Air Travel



Another Aer Lingus innovation at Dublin Airport (see opposite page) is this cargo terminal, opened last month. Based on an existing hangar, it accommodates all sections of the airline's cargo branch under one roof

C.A.B. AND THE FARE DIFFERENTIAL

THOUGH the Civil Aeronautics Board inevitably approved the I.A.T.A. agreement on the jet *v.* turboprop fare differential, just as it previously approved jet surcharges on U.S. domestic services, the Board is still non-committal about the long-term desirability of a differential.

It will be recalled that the C.A.B.'s original statement of policy was neither approving nor disapproving; now the Board has put on record a further statement. In this it says: "In view of the fact that the agreement is to be effective for a limited period, a year in which the major transition to jet operations should be accomplished . . . the Board concludes that the approval of the agreement would be consistent with the public interest."

In approving the surcharge for U.S. domestic flights, the Board said that its action "should not be construed as a final determination of the complex pricing problems that may attend the introduction of commercial jet air services." The fare differential thus seems to be one of those rare matters of pricing controversy on which the C.A.B. has given no positive guidance to the airlines. Rather has it remained non-committal and fallen in with the proposals of the airlines, international as well as U.S. domestic.

CDR. G. O. WATERS

IT is with regret that *Flight* records the death, after a long period of ill-health, of Cdr. G. O. Waters, O.B.E., until April 1 last year chairman and managing director of Air Terminals Ltd.

After serving as Croydon's first station superintendent from 1929 until 1934, he became commercial assistant to Railway Air Services and later general manager and then managing director of Channel Island Airways, Jersey Airways and Guernsey Airways. Cdr. Waters joined B.E.A. in 1946, eventually becoming traffic director, and in 1955 was appointed chairman and managing director of Air Terminals, with the responsibility for building and operating the West London air terminal, in Cromwell Road, South Kensington.

NO BREAD IN THE SANDWICH

WITH I.A.T.A.'s rather pompous-sounding resolution at Paris in February to "liberalize the provisions for economy-class catering" passed one of the warmest—and silliest—air transport controversies of recent years: "What is a sandwich?" The sandwich became the austerity symbol of the economy class and *Flight*, with many others, poked fun (most recently in "The Economist," March 27, 1959) at the more-than-liberal interpretation of the ruling imposed upon themselves by members of the international association of airlines.

Now the airline sandwich is no more; from the beginning of this month it became a memory, to join the luncheon box and the wickerwork chair. The open-sandwich meal has been replaced by "cold collations." B.O.A.C., for instance, are now offering meals including two cold meats (from a choice of chicken, ham, turkey, fillet beef, ox-tongue or meat pie) with mixed salad, and roll and butter, followed by cheese and fruit. They can serve coffee, tea, milk, mineral water and fruit juices, and bread and butter, preserves or sandwiches in between meals. The concessions include permission to sell one packet of cigarettes to each economy-class passenger; and full cigarette and liquor services will be offered after October 1.

BREVITIES

The Air Registration Board have issued the following amendments to B.C.A.R.s: Contents list, issue 28; general foreword, issue 20; section "D," issue 4.

* * *

It is reported from Warsaw that negotiations are in progress for the establishment of a joint communist airline to operate transatlantic services with Tu-114s. LOT expects to use turboprops on all international services by 1961.

* * *

It is reported from Moscow that certification trials of the Il-18—which was originally expected to enter service last year—have now been completed. Its appearance "in large numbers in the very near future" is promised.

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I.A.T.A.'s 72-hour reservation reconfirmation rule has been extended to include international flights from the U.K., Ireland, continental Europe and Israel, as well as Canada and the U.S. In the European area, the rule applies only to westbound transatlantic passengers.

* * *

S.A.S. intend to start Caravelle services on May 15, three days after Air France. The first four Caravelles from Sud-Aviation should have been delivered by April 15 and five others will be delivered this year. Deliveries in 1960 will be at the rate of one a month for four months and thereafter at two a month.

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Pan American are planning a Boeing 707-120 proving flight to Buenos Aires, in anticipation of possible summer jet schedules to South America. *Aviation Week* reports "uncertainties" as to airports, navigation and other operational problems. Next month Pan American will increase jet services from London to New York to two per day.

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Two new books in the "Famous Airliners" series by Derek Harvey have been published. One (No. 3 in the series) describes in accurate detail the Douglas airliners DC-1 to DC-7C, and the other (No. 4) describes the de Havilland Comet family. The publishers are Cassell & Co. Ltd., 35 Red Lion Square, London, W.C.1, and the price of each book is 10s 6d.

T.W.A.'s operating loss in 1958 was about £139,000. Losses in the previous two years were £1,620,000 and £1,479,000.

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On March 31 Allegheny Airlines conducted a simulated scheduled operation over their routes with the Canadair 540.

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If Air Ceylon receive rights to operate a new Colombo-Rangoon-Canton or Peking service they may buy Electras or Comet 4s.

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Eagle have postponed introduction of the Manchester - Hamburg - Copenhagen service until 1960. Reasons given are "present equipment problems and the late announcement of the service."

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A second Britannia 307 for Air Charter was delivered to Southend on March 24. It had previously been operating on charter to El Al.

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There were no survivors among the 24 people on board an Indian Airlines' DC-3 which crashed shortly after taking off from Agartala, Assam, on March 28. The cause of the accident is not known.

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Saab are reported to be doing design studies and conducting a market survey into the possibilities of building a transport of about Friendship size powered by twin Darts. Svenska Flygmotor might build the engines under licence.

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The arrangement made last year between Aerlinte and Seaboard and Western, whereby the latter undertook to invest £500,000 in Aerlinte, has been cancelled as a result of the purchase by the Irish airline of three Boeing 720-048s to operate on Irish transatlantic services.

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Pac Aero at Santa Monica are undertaking the first production Allison 501-D13 re-engining of a Convair 340. The aircraft was purchased by Allison from Hawaiian Airlines. F.A.A. certification is aimed for October and a fixed price of £174,000 per conversion is offered. Allison's original Convair conversion, the Turboliner, has been sold to a private operator.

"Flight" photograph

On his visit to Cottesmore (see pp. 482-3) the Prime Minister is here seen meeting F/L. D. Bryan and his crew of No. XV Sqn., who when on their last training sortie at Gaydon had hydraulic failure in a Victor. F/L. Bryan (at left of row) and his co-pilot made a successful wheels-up landing after the other crew members had baled-out

SERVICE AVIATION

Royal Air Forces and Naval Flying News

Sir Hubert Promoted

NOW Air Chief Marshal, Sir Hubert L. Patch was promoted from air marshal on April 1, when he took up his new post as Air Member for Personnel. He had previously been Commander-in-Chief of the Middle East Air Force.

Ministerial Tour

NEXT Sunday the Secretary of State for Air, Mr. George Ward, is due to return to this country after making a short overseas tour which started on April 2. His itinerary included staging posts in Africa and R.A.F. units in Kenya and Cyprus. Flying by Comet 2 of Transport Command, the Secretary of State was also paying a visit to the Royal Rhodesian Air Force.

Change of Control

RESPONSIBILITY for the control and training of some 39,000 air cadets and 860 members of 17 university air squadrons has now passed to Flying Training Command, following the abolition of Home Command at the end of last month. The A.O.C-in-C. Flying Training Command, Air Marshal Sir Hugh Constantine, has assumed the additional title of Commandant of the Air Training Corps; and to assist him, an air commodore has been appointed deputy commandant.

He is A. Cdre. J. N. W. Farmer, who was until recently in the department of the Assistant Chief of the Air Staff (Training) at Air Ministry as a deputy director. His staff will include G/C. H. E. Bufton, who will be responsible for units of the A.T.C., and G/C. J. E. Grindon, responsible for R.A.F. sections of the Combined Cadet Force.

Field Squadron Honoured

FIRST unit of the R.A.F. Regiment to be so honoured, No. 1 (Field) Squadron was due to receive its Standard last Wednesday at El Adem, near Tobruk. The presentation was being made by Air Marshal Sir Hugh Constantine, the A.O.C.-in-C. Flying Training Command, who was a member of the squadron before the war when it was known as No. 1 Armoured Car Company. Formed in 1921, it was incorporated in the R.A.F. Regiment in 1946 as a squadron.

Rugby Champions

WITH a well-deserved 11pt to 3 victory over the Army at Twickenham last Saturday (by a goal, a try and a penalty goal to a try) the R.A.F. won the Services' rugby union championship outright for the first time since 1923, having already beaten the Navy in this year's competition. Their success owed much to their captain, Brace, whose cool head and sound tactical sense were invaluable to his side; and Wright at full - back and Head and McGovan in the forwards all did well against a strong Army team whose potential was never fully realized. Though splendidly led by Bruce, its forwards never got the upper hand with the R.A.F. eight; and though Blackett at stand-off did some delightful kicking and running, the Army only once caught the R.A.F. defence off balance and had to be content with a single try by Williams. The R.A.F. scorers were Burgess and McGovan, Mettler converting the latter's try and also kicking a penalty goal.

Cranwell to Colorado

THIRTY cadets from the R.A.F. College at Cranwell are visiting Canada and the U.S. They left by Comet 2 of Transport Command last Saturday and are due to return to this country on April 17. The party is headed by the Commandant, A. Cdre. D. F. Spotswood, and accompanied by the director of studies, Mr. Anthony Constant. Its itinerary includes the Royal Military College of Canada at Kingston, Ontario; the H.Q. of Strategic Air Command at Omaha, Nebraska; and the U.S.A.F. Academy at Colorado Springs.

R.O.C. Commandant

FROM May 4 the Royal Observer Corps is to have a new Commandant, when A. Cdre. J. M. Warfield takes over from A. Cdre. J. H. T. Simpson, who is retiring. The Commandant-designate has been A.O.A. at Headquarters, British Forces Arabian Peninsula, since 1957. Before going to Aden he was A.O.C. No. 66 (Scottish) Group, Home Command. His predecessor, A. Cdre. Simpson, has played a major part in the successful adoption by the R.O.C. of its new responsibility in reporting radioactive fall-out. Since this rôle became a reality he has worked tirelessly to initiate training courses and to put the system on an operational basis.

May Reunions

THREE R.A.F. reunions are due to take place during May. Their titles, dates and organizational details are as follows:—

Coastal Command Officers: Saturday, May 2, at the Officers' Mess, H.Q. Coastal Command, R.A.F. Northwood, at 6 p.m. Dress, lounge suits. All officers who have served in the Command since September 3, 1939, are eligible to attend. Tickets (15s each) may be obtained from the hon. secretary, Wg/O. M. F. Arkell, H.Q., Coastal Command, R.A.F. Northwood, Middx.

No. 60 Sqn. Officers: Friday, May 8, at the Royal Air Force Club, Piccadilly, London, W.1. Dress, lounge suits. Tickets (13s 6d) may be obtained from W/C. C. Howells, Air Ministry, Room 645, Horseferry House, Horseferry Road, London, S.W.1.

H.Q. Bomber Command Association of Officers: Saturday, May 23, at Headquarters Bomber Command, R.A.F. High Wycombe, Bucks. Any member of the Association who has not received details of this reunion may obtain them by writing to the hon. secretary, G/C. A. V. Rogers, A.F.C., at the above address.

A. Cdre. E. M. Donaldson, Commandant of the R.A.F. Flying College, presenting a pilot's flying badge when he reviewed the passing-out parade of Nos. 126 and 127 courses at Swinderby. The recipient is S/Lt. Budiharto of the Indonesian Navy, and with the reviewing officer are Dr. Sunario the Indonesian Ambassador and W/C. F. Symmons the Wing Cdr. Flying

UNKNOWN